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NOTES FOR THE MONTH

THE following note has been communicated by the National Institute of Agricultural Botany :—

Sugar-Beet Strains

At the present time a good many prospective growers will be wondering which of the various sugar-beet strains will pay them best under the new conditions of the 1931 contracts. Elaborate trials which the National Institute of Agricultural Botany has carried out in the principal beet-growing districts during the last four years show that, in general, the strain to select is the one that will produce the most sugar per acre.

It should first be explained that the large number of strains offered by breeders of mangel beet fall into three more or less distinct types, usually ... " and " N." The " E " type is specia... d combined with reasonably good suga... ' (or " ZZ ") type the first consideratio... ile the " N " type is produced as a compromise between the two. Many seed firms offer more than one type, and growers should note that the selection of the right type is quite as important as the choice of the product of the right firm.

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Of individual strains the Institute recommends *for general cultivation :—*

Kleinwanzleben E.—The yields of this strain are so consistently high that, in spite of its rather lower sugar content, it generally gives more sugar per acre and higher cash returns than any other strain, even after making allowance for slightly higher freight charges. It is particularly good on the lighter and more friable soils. It produces a rather large top and does not bolt badly. Its roots are of good shape, generally free from fangs, and therefore easy to lift and clean.

Dippe E is very similar in character and behaviour to Kleinwanzleben E and has given only slightly lower returns on an average. On very heavy clay it has even yielded more

sugar per acre. It is, however, more apt to bolt and does not lift so easily.

When seed of the two above strains is unobtainable, the "E" type *Hoerning H.S.*; the "N" types *Strube E*, *Zapotil II*, *Kleinwanzleben N*, and *Dobrovice*; and the "Z" type *Hoerning R.R.*, are all worth consideration. Polish strains should, however, be avoided, for though their sugar contents are high, their yields are relatively low, and they generally bolt very badly.

For very rich soils it is safe to choose :—

Marsters, an English-grown "Z" type. Its sugar content, sugar yield per acre and cash return are high, and the roots are generally of good shape, free from fangs and easy to lift. It has a small top, which is an advantage on rich fen or silt land, and it bolts less than any other strain.

Johnson's Perfection, English-grown seed derived from Kuhn P, has done nearly as well as Marsters, though it is not quite so free from bolters.

Kuhn P, a Dutch strain approximating to the "N" type. In the years 1927-1929 its merits were very similar to Marsters, but in 1930 its top was larger and it produced more bolters.

Failing these strains *Kleinwanzleben N* should be given a trial.

For early sowing on all types of soil, *Marsters* and *Johnson's Perfection* are particularly suitable owing to their freedom from bolting.

A useful four-page leaflet dealing with "Strains of Sugar-Beet" has just been published by the Institute, and copies may be obtained on application to the Secretary, N.I.A.B., Huntingdon Road, Cambridge. (Uniform with this the Institute issues leaflets on "Varieties of Cereals for Spring Sowing," "Varieties of Cereals for Autumn Sowing," "Varieties of Potatoes" and "Lucerne.")

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Mineral Content of Natural Pastures

IN 1925 the Committee of Civil Research, subsequently absorbed in the Economic Advisory Council, appointed a sub-committee, under the Chairmanship of Major Walter Elliot, M.P., "To consider and report on the mineral content of natural pastures." The investigations were carried out partly in Kenya and partly in Scotland, and certain subsidiary work was undertaken at Cambridge, Edinburgh, Aberystwyth, and elsewhere. Funds were provided by the Empire Marketing

Board, and the Government of Kenya provided about 4,000 acres of land together with a handsome contribution towards the purchase of the necessary stock and other accessories.

Apart from the value of the results obtained, the investigation is of interest as an example of successful Imperial co-operation in research. The workers included members of the Committee, such as Dr. J. B. Orr, who initiated the programme in Kenya; settlers in Kenya who provided animals and facilities for the feeding experiments; research workers at the Rowett Institute, Aberdeen, some of whom proceeded to Kenya; officers of the Kenya Agricultural Department; and a number of temporary workers, some of whom worked in Kenya and some in Aberdeen.

The most important of the results obtained are summarized in the Sixth Report of the Committee.*

The pastures in all four districts of Kenya from which samples were taken are, as compared with good pastures, markedly deficient in sodium, and, to a less extent, in chlorine. In one district the pasture, apart from the deficiencies referred to, is as rich as good British cultivated pasture. In the other three districts the pastures were deficient in all mineral nutrients and in protein. The element most deficient was phosphorus. In one district the deficiency of phosphorus was as great as that found in certain areas in South Africa where it is the cause of diseases in cattle.

The yield of pasture was greatly increased by the application of fertilizers, and to some extent by common salt alone; and grazing animals showed a marked preference for the parts that had been treated with fertilizers.

In districts where the pastures were deficient in certain minerals the provision of these to grazing animals was followed by a marked increase in the milk yield of dairy cows, in the rate of growth of lambs, and in the weight of the fleece of sheep. Where there was no mineral deficiency no benefit resulted.

In one district where the investigation had for its object the discovery of a method of preventing a "deficiency disease" (wasting), it was found that access to a mixture of common salt and an iron salt achieved the desired result.

It is interesting to compare parts of Kenya, where there are prolonged periods of hot, dry weather, with districts such as the West Highlands of Scotland, where there is a uniformly distributed high rainfall. It is generally found that in the former the main deficiency is phosphorus; in the latter

* *Economic Advisory Council: 6th Report on the Mineral Content of Natural Pastures.* H.M. Stationery Office, 1931. Price 1*s.* net. Post free, 1*s.* 1*d.*

calcium. We have phosphorus-deficient soils in this country also, however, and although the deficiency may seldom be such as to lead to ill-health we do find that on certain soils of this character animal growth is relatively slow and stunted. Analysis of the soil shows that deficiencies in the pasture are, in general, a reflection of deficiencies in the soil. There is a close correlation between the amount of available phosphorus found in the soil and the average amount in the herbage. In Kenya soils, phosphorus appears to be a limiting factor for the assimilation of minerals and, indeed, the limiting factor for the growth of good pasture. It is probable that the enrichment of the soil in phosphorus would be followed by an increase in the amounts not only of the phosphorus but of other minerals in the herbage.

The deficiencies of pasture vary as between different areas. Consequently, an analysis of the pasture confirmed by a feeding test is needed on each type of pasture to ascertain whether the feeding of minerals is desirable and, if so, what is the right kind of supplement to give.

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Fees for the Testing of Agricultural Machinery

THE following is the revised schedule of fees to be charged for tests of agricultural machinery carried out under the supervision of the Agricultural Machinery Testing Committee. This schedule comes into operation as from April 1, 1931 :—

SCHEDULE

Applications for tests of agricultural machinery and implements not specified in this Schedule will be considered by the Minister, and, if accepted, provisional fees will be quoted.

CLASS I.—*Prime Movers (including Engines and Motors)*

		Fee
(*a*) Electrical Motors, Internal Combustion Engines not exceeding 20 B.H.P.	*Belt Test*	£2 per B.H.P. with a minimum charge of £10.
(*b*) Agricultural Tractors with Internal Combustion Engines not exceeding 30 B.H.P.	*Belt Test*	£2 per B.H.P. with a minimum charge of £10.
	Traction Test	£2 per B.H.P.
(*c*) Water wheels or water turbines not exceeding 20 B.H.P.	—	£2 per B.H.P. with a minimum charge of £10.
(*d*) Windmills with wheels not exceeding 16 feet in diameter.	—	£2 per foot diameter of wheel with a minimum charge of £10. Fractions of a foot will count as one foot for calculating the fee.

(1) B.H.P. as used in (*a*), (*b*), and (*c*) above means—

(i) *in the case of internal combustion engines, the Treasury rating,* *i.e.*, $\frac{d^2n}{2{\cdot}5}$ where d = diameter of cylinder in inches and n = number of cylinders.

(ii) *in the case of other prime movers,* the maximum brake horse-power as defined by the manufacturer.

(2) Fractions of a H.P. less than 0·1 will be neglected and fractions of 0·1 or greater value will count as 1 H.P. for calculating the fee.

CLASS II.—*Field (including tillage and harvesting) machinery*

	Fee: *Short Test* £ s. d.	*Seasonal Test* £ s. d.
Ploughs, single or double furrow	11 0 0	17 0 0
Ploughs, Tractor	15 0 0	22 0 0
Subsoiling attachments with plough	6 0 0 extra	9 0 0 extra
Subsoiling attachments apart from plough	7 0 0	10 0 0
Cultivators, Horse	11 0 0	17 0 0
,, Tractor	15 0 0	22 0 0
Broadshares, Horse	11 0 0	17 0 0
,, Tractor	15 0 0	22 0 0
Hoes	6 0 0	9 0 0
Harrows, Horse	6 0 0	9 0 0
,, Tractor	7 0 0	10 0 0
Land Rollers, Horse or Tractor	6 0 0	9 0 0
Manure Distributors	15 0 0	22 0 0
Drills for corn or seed	15 0 0	22 0 0
Mowers without reaping attachment	15 0 0	22 0 0
Mowers with reaping attachment	16 0 0	24 0 0
Binders or Self Reapers	22 0 0	30 0 0
Rakes, Haymakers, Tedders, Swath Turners	12 0 0	18 0 0
Hay Sweeps		
Hay Loaders	15 0 0	22 0 0
Stookers and Shockers	15 0 0	22 0 0
Potato Planters, Potato Diggers and Harvesters	15 0 0	22 0 0
Turnip Thinners	12 0 0	18 0 0
Turnip Topping, Tailing and Harvesting machines	15 0 0	22 0 0
Sugar-Beet Lifters	15 0 0	22 0 0

CLASS III.—*Barnyard (including food preparing, corn threshing and cleaning, and transmission) machinery*

	Fee: *Short Test* £ s. d.	*Long Test* £ s. d.
Hay and corn drying appliances	18 0 0	27 0 0
Silo Cutter and Blower	18 0 0	27 0 0
Potato Sorter	12 0 0	18 0 0
Pulper, Chaff Cutter, Grinder, Cake Breaker — Manual	6 0 0	9 0 0
Threshing machines with drums not exceeding 3 ft. 6 ins. in length	£15 per foot length of drum.	

CLASS IV.—*Dairy machinery and appliances*

The actual fees to be charged in this class will be determined by the Minister on the advice of the Supervisory Committee, and will be communicated to applicants before applications are accepted. The following are *minimum* charges, and do not include the cost of milk or other special material that may be required for testing a particular machine, for which a deposit may be required under Regulation 7.*

	Minimum Fee	
	Hand	*Power*
	£ s. d.	£ s. d.
Cream Separators	20 0 0	25 0 0
Farm Milk Coolers	5 0 0	—
Butter Churns	8 0 0	10 0 0
Butter Workers	8 0 0	10 0 0
Homogenizers	20 0 0	25 0 0
Refrigerating plants	—	25 0 0
Cheese Vats, Presses, Mills	8 0 0	10 0 0
Bottle Fillers ranging from small hand-fillers to power-driven plant	5 0 0	15 0 0
Bottle washing Machines	—	25 0 0
Mechanical Milkers	—	30 0 0
Emulsifiers	20 0 0	25 0 0

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Wild White Clover

LAST year a scheme for the certification of crops of wild white clover seed was brought into operation by the National Farmers' Union with the co-operation of the Ministry. The importance of genuine wild white clover seed in sowing down permanent pastures and leys of long duration is well recognized, and the object of the scheme is at once to encourage the production and marketing of genuine home-produced wild white clover seed and to enable prospective purchasers to ensure that they obtain the genuine article.

The broad outline of the scheme is that growers of wild white clover seed may apply to have their pastures examined and recorded as eligible to produce either genuine old pasture seed or seed once grown from old pasture seed. Each field submitted for recording is, on payment of a small fee, examined by officers of the Ministry, and a sample of clover heads is taken for a "growing-on" test. Provided that the history of the field and the results of these two tests are satisfactory, the field is recorded, and in subsequent years when the applicant desires to take a crop of seed he is entitled to apply for a certificate in respect of that crop.

Full particulars of the scheme and copies of the form of application for inspection may be obtained on application to

* The Regulations governing the testing scheme are printed in an explanatory pamphlet, copies of which may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

the National Farmers' Union, 45 Bedford Square, London, W.C.1, or to any of the County Branches of the Union. Applications for field inspections to be carried out this year must be made by April 15, 1931.

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Celery Diseases

CELERY is a greatly relished and valuable vegetable, and very considerable quantities are grown. The district of Lincolnshire known as the Isle of Axholme contains an extensive area largely devoted to celery growing on a field scale. About six years ago The Midland Agricultural College received constant appeals for assistance from the celery growers in this area. They complained that in most seasons serious losses were incurred from diseases of different kinds that attacked both the seedlings and the adult plants. A preliminary inquiry showed the matter to be of serious importance, and with the assistance of grants secured through the Ministry from the Development Fund, the College undertook a detailed investigation. The report of the investigators, Messrs. Stirrup and Ewan, is now available in the form of a Bulletin.* The investigations, which lasted five years, were not of a purely mycological character, but rather of a practical nature. The seedling diseases of celery are dealt with in the report, together with practical recommendations for their control. Special attention is given to the control of "Leaf Spot" or "Blight," and the production of disease-free seed, while a further chapter describes the results of promising experiments in the control of the Carrot Fly (*Psila rosae*), a pest that often causes serious losses to celery crops. The Bulletin is attractively produced and illustrated, and should be of value to celery growers in all parts of the country.

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The Musk-Rat Danger

IN reply to a Question in the House of Commons by Major Graham Pole early in March as to the possible danger from musk-rats escaping from confinement and breeding in this country, the Minister of Agriculture replied that he was considering whether Parliament should not be asked to legislate upon the subject at an early date. Pending a

* Bulletin No. 25, *Investigations on Celery Diseases and Their Control*, price 1*s.* 0*d.*, or 1*s.* 1*d.* with postage, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

decision on that question, he hoped that all persons keeping musk-rats would take notice of the position, and use every possible precaution to prevent any of these animals escaping from confinement. He expressed the hope, also, that there would be no extension of musk-rat keeping in this country.

In the Question Major Pole referred to the growing numbers of musk-rats that were being imported, bred and kept in this country. He said that several cases were known of animals having escaped from confinement, and that great damage had been done by musk-rats in Central Europe since their importation and establishment there. The special measures found necessary to deal with the pest had involved considerable expense in both Germany and Austria.

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THE following note has been communicated by Messrs. F. H. Garner and H. G. Sanders, the School of Agriculture, Cambridge :—

Sulphuric Acid Treatment of Sugar-Beet Seed

During the past four years trials have been carried out on the University Farm, Cambridge, on the effect of treating sugar-beet seed with concentrated sulphuric acid. The beet seed that the farmer sows is not a true seed in the strict botanical sense. It is really an aggregation of two or more one-seeded fruits, to each of which remain attached the hardened receptacle and the floral perianth. The whole forms a compact " cluster " in which the two or more true seeds are embedded. The action of strong sulphuric acid on these seed clusters is to char or corrode away the parts in which the true seeds are buried, and thus to a large extent to " decorticate " them and render them more readily responsive to the factors that induce germination.

Preliminary observations were made in 1927 and 1928, and many visiting farmers were impressed by the obvious gain from the treatment. It was clear that the seed treated with sulphuric acid germinated much more quickly and evenly than the untreated seed, and gave a markedly better " plant." Precise confirmation of this was obtained from experiments carried out in boxes in the early part of 1929, when it was found that germination was advanced by about four days, and was also more complete. These trials were so convincing that large-scale experiments on the farm were deemed desirable ; the latter were carried out in 1929 and 1930. In each of these years four separate experiments—covering nearly 10 acres—were

carried out, and the average yields in tons of washed beet per acre were as follows :—

Year	*Treated Seed*	*Untreated Seed*	*Gain from Treatment*
1929 ..	13·02	11·28	1·74
1930 ..	12·34	11·47	0·87

In each year the gain was considerable (the percentage of sugar was unaffected), but it will be noticed that the increase was just twice as large in 1929 as in 1930. This was undoubtedly due to different moisture conditions at seeding time ; in 1930 the seed-bed held plenty of moisture, and rain fell subsequently; in 1929, on the other hand, no rain fell for some time after sowing, and in that year, therefore, quickened germination was particularly advantageous.

Treated seed is much smaller than untreated seed and is of a dull, dark brown colour. Its cost is higher (1s. 3d. per lb. as against 6d.), but, of course, each pound contains more seeds ; treated seed also runs rather better in the drill.

The financial returns to the University Farm from the small additional expenditure on seed are shown by the following figures, in which it has been assumed that the extra weight of tops, if folded, would pay for the extra cost of lifting and delivery to the station :—

	1929	1930
Extra yield of washed roots per acre (*tons*)	1·74	0·87
	s. d.	s. d.
Extra value of roots per acre	85 6	47 9
Extra cost of seed per acre	5 9	6 6
Extra rail charges per acre	6 6	3 3
Gain per acre	73 3	38 0

Such a return can scarcely be disregarded, and during the coming campaign it is intended to try the treatment under a variety of farm conditions in the Eastern Counties.

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The Ministry's Publications

THE Ministry desires to announce that, on and after April 1, the publication of its Leaflets and Bulletins will be taken over by H.M. Stationery Office. All publications will continue to be on sale *to personal applicants* at the Ministry's Office at 10 Whitehall Place, London, S.W. 1, and applications by post for *free leaflets* should also be sent to that address.

Readers should note, however, that *postal applications enclosing remittances* for publications should now be addressed

to H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. In such cases postage will also be payable ; in general the sum of 1*d.* or 2*d.* per publication will cover such charge. A further announcement will be made in the May issue of this JOURNAL.

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Agricultural Machinery in Canada and the U.S.A.

IN 1928, the Ministry issued a report on "Agricultural Machinery and the Organization of Labour in Australia, New Zealand and Canada."* Following the publication of this report, the Ministry received representations that fuller information should be obtained regarding the development of the use of machinery in America.

The Ministry, therefore, invited Mr. Thomas Baxter (nominated by the National Farmers' Union), Mr. George Clarke (nominated by the National Union of Agricultural Workers), and Mr. J. E. Newman (of the Institute of Agricultural Engineering, University of Oxford) to visit Canada and the United States of America and to report upon the possible value to British agriculture of American methods dependent on the extended use of machinery.

This further report has now been issued by the Ministry as a Bulletin.† "Combines," hay-making machinery, potato-diggers and practically all the types of agricultural machinery now in use in N. America are described in this publication, and their advantages and disadvantages discussed from the British point of view. In some instances the acquisition of machines for trial in this country is recommended. Mention is also made of the courses in agricultural engineering and tractor maintenance provided by the agricultural colleges, and a suggestion is put forward for the introduction of similar courses in this country. The report, in Bulletin form, is well-produced, contains 22 illustrations, and should be valuable for the guidance of all those who are interested in the mechanization of British agriculture.

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* Miscellaneous Publication No. 67. Price 1*s.*, post free 1*s.* 1*d.*

† Bulletin No. 27, *Agricultural Machinery in Canada and the United States of America.* Price 1*s.* 3*d.*, post free 1*s.* 5*d.*

Both publications obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

LUCERNE

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

LUCERNE (*Medicago sativa*) is a native of south-western Asia, and was introduced into England about the middle of the seventeenth century. Since that time references to it as a valuable forage plant are frequent, while its merits were extolled more than 2,000 years ago. It is one of the most valuable of our forage plants, has high feeding value, high cropping powers and is a noted soil improver, yet it does not receive the attention from the British farmer that its great utility seems to justify.

It is extensively cultivated in France and Germany, and is widely appreciated in South America, the United States and Canada. The area under lucerne in England and Wales varies from year to year, with a general tendency to increase over a series of years to a peak, after which there is a gradual decline. During the present century, 1909 was one of the peak years, when 65,293 acres of lucerne were grown; the subsequent decrease in acreage was considerable, and in 1911 only 53,123 acres were grown. Increases were recorded in 1912 and again in 1913, but thereafter the decline was almost continuous until 1919 when the area was 38,761 acres. A revival took place after 1919 and another peak period was reached in 1924 when 64,615 acres of lucerne were grown. After 1924 the area rapidly declined until in 1929 the area was only 35,783 acres. This was followed by a small increase to 39,800 acres in 1930. In contrast with this more or less stationary position it is interesting to note the progress made in America. In Argentina in 1902-03 the area was 4,273,503 acres, and, in 1923-24, it had increased to 19,290,000 acres; the United States had 2,000,000 acres in 1900 and 11,040,000 acres in 1925; in Canada the area increased from 57,000 to 400,000 acres between 1909 and 1924.

There is evidence that in England the average rainfall for the year has a considerable influence on the area devoted to lucerne in the following year. The years 1904 to 1908 were comparatively dry, and during this period the area of lucerne gradually increased until the peak was reached in 1909. The seasons 1909 and 1910 were comparatively wet and decreased acreages followed. A dry year in 1911 stopped the decline and increases were recorded in 1912 and 1913, after which the war years interfered with the normal course of events. The dry year in 1921 stimulated the cultivation of lucerne

and in 1924 another peak area was reached, after which the decline was rapid until the very low area recorded in 1929. The summer drought in the Midlands and the south of England in 1929 may partly account for the increase of about 4,000 acres reported in 1930.

The main lucerne growing counties in England are Essex, Kent, East and West Suffolk, and Hertfordshire. These counties together contain 70 per cent. of the lucerne in England and Wales. Essex and Kent easily lead all other counties in the proportion of arable land devoted to lucerne. It is also significant that over 84 per cent. of the area of lucerne in England and Wales is to be found in counties with an average rainfall of 30 in. or less per annum. The changes in the acreages from time to time are much the same both within and without the more favoured counties; and it may be implied that, even in the areas where lucerne is grown most extensively, it is regarded as a special crop and has not obtained an established place in the farming system.

Soils.—Lucerne is suited to a wide range of soils; drainage is most important and a well-drained soil and subsoil are absolutely necessary. Deep, productive loams are best, but with the exception of peaty soils any well-drained soil will grow lucerne. The soil must not be acid; Thornton (1) states that the limit of acidity which checks growth of lucerne and injures the nodule-forming bacteria is about pH 5·0.

Manuring.—Lucerne is a legume, and like other legumes derives its main supply of nitrogen through bacteria that live in nodules which they cause to form on the roots. A favourable condition must be created for nodule-forming bacteria as well as for the growth of the lucerne plant. Lime should be used to correct acidity. Organic matter is also necessary. If the preceding crops have been freely manured with farmyard manure there is no need to make any further application, but otherwise a dressing of 10 to 12 tons per acre should be ploughed in before the lucerne is sown. In other respects the lucerne plant requires mineral manures similar to those demanded by red clover; phosphates are most important on heavy soils, and both phosphates and potash are required on light soils. Lucerne develops a strong tap root that goes very deeply into the soil and, in consequence, it is difficult to influence materially the subsequent growth by late applications of manure. The initial application should be liberal. Nitrogen is not normally required, but where the land is in

poor manurial condition a small quantity, not more than 1 cwt. per acre, of a nitrate such as nitrate of soda or nitrate of lime will be beneficial in the early stages.

Place in Rotation.—Lucerne must be sown on thoroughly clean land. The presence of couch is fatal to the success of the crop. Land that has grown a root crop and has been well manured and well cleaned is perhaps the best. There is a further advantage in choosing such land, as the soil should be readily worked down to a good seed bed.

Seeding.—The time to sow, the method of sowing and whether or not there should be a cover or nurse crop are controversial matters. The National Institute of Agricultural Botany (2) recommend that no cover crop should be used, that the lucerne should be drilled in rows 10 to 12 in. apart, and that drilling should be done in April in the east and July in the west. Thornton (1) refers to experiments made in Somerset, Montgomery, Monmouth and Cumberland, where sowing in a cover crop in spring gave better results than sowing in bare ground in the summer. Stewart (3) states that for the United States as a whole it is not desirable to sow with a nurse crop, so far at least as the welfare of the lucerne is concerned, and that nearly all American experiment stations, except those in regions with dry summers, now recommend mid-season as the best seeding time.

The problem as to what particular method should be adopted is closely associated with the type of weeds to be contended with and the method of dealing with them. A cover crop has advantages by covering part of the ground and reducing the number and size of annual weeds; it shades the young lucerne and protects it from the scorching sun in its early stages and it provides a greater return from the land in the lucerne seeding-year. The produce from lucerne alone is rather small in the first year. On the other hand, the cover crop competes with the lucerne for the available nutrients and moisture, and if it is sown too thick, or thrives too luxuriantly, or is allowed to stand too long before it is cut, the lucerne will be much weakened, if not partly killed. It is possible to use the cover crop in such a way as to obtain all the advantages and avoid the disadvantages. The essential points to bear in mind are that the cover crop must be sown thinly: 3 bus. of oats per acre should not be exceeded.

The cover crop and lucerne seed should be sown on the same day to equalize as much as possible the competition between the plants. Enough mineral manures should be given to ensure that both crops will be satisfied. The cover crop should be cut and removed before it does damage to the lucerne. This will depend on the thickness and luxuriance of the crop, but in any case cutting should be done about 10 weeks after seeding, and unless growth has been very slow not later than 12 weeks after seeding. This means that the oats must be cut whilst still green ; it is most inadvisable to wait until the oats can be harvested as grain.

Such a method is well adapted for spring sowing. The time of sowing should be as early as is considered safe from damage by frost ; this depends on the situation, elevation, latitude and season. In the south, success has followed when lucerne was seeded at the end of March, but, as a general recommendation, the latter half of April and up to the middle of May is to be preferred.

The amount of seed will depend on whether the seed is broadcast or drilled, and on the condition of the seedbed. The seedbed must be fine and firm, and the seeds should not be buried more than 1 in. deep. Broadcasting will require more seed than drilling. The National Institute of Agricultural Botany (2) advise 25 lb. of seed per acre when drilled, and the writer has always found this quantity sufficient for broadcasting when the seedbed was satisfactory. The object of drilling is to provide an opportunity to destroy weeds ; if the seed is drilled in rows 9 to 12 in. apart, hoeing and weeding is possible, and must be done, or weeds will be more prevalent than if broadcasting were practised. There can be no doubt that drilling and hoeing will give stronger individual plants, but the yield per acre may not be materially increased, and when due regard is paid to the labour involved the results may not justify the means. On reasonably clean land—and no other should be sown with lucerne—broadcasting will produce satisfactory crops at less cost.

Variety of Seed.—The most popular and widely grown strain of seed sown in England is Provence, grown in France. English-grown seed of Provence strain if available, and if the germination is good may be used to replace the French-grown seed. The National Institute of Agricultural Botany (2) record success with a Hungarian strain ; and Marlborough, a New Zealand strain, has given distinct signs of promise in a trial laid down in 1929. A variety known as Grimm is noted for its hardiness and might be preferred in

cold and upland districts where the winters are severe. For the south and midland regions of England, Provence can be recommended.

Sowing in Mixtures.—Lucerne is usually grown alone, but various suggestions have been made that the addition of clovers or grasses would fill up the ground and prevent weed infestation. Trefoil and wild white clover have both been tried, but either of them will fill up the ground too well; for while they produce an excellent turf, which is a good preparation for cereal crops, they have a distinctly harmful effect on the lucerne and cannot be recommended. Grasses such as ryegrass, meadow fescue, and timothy have also been used, but the general tendency is to injure the lucerne and shorten its useful life.

Inoculation of Seed.—Lucerne will not grow successfully unless it is associated with the appropriate nodule-forming bacteria. Thornton (1) found that in East Anglia and Kent the bacteria were usually present in the soil in sufficient numbers to satisfy the requirements of the plant. In the midland and south central districts there was usually a small population of lucerne nodule bacteria, but inoculation was advisable. In the south-west, west and north, inoculation was necessary. Thornton, working at Rothamsted, has evolved a satisfactory culture and mode of treatment which has opened up a new field for lucerne cultivation. Arrangements have been made for Messrs. Allen & Hanbury, Bethnal Green, London, E. 2, to supply cultures as perfected at Rothamsted. The procedure is simple and full instructions are sent with the culture. Wherever any doubt exists as to the suitability of the soil, inoculation should be carried out.

After-Treatment.—The seeding year is a critical one for lucerne. The amount of growth is small and little or no produce is obtained, and hence weed growth may do much damage. The seedling plant has a single stem but, a few weeks after growth commences, buds begin to develop at the junction of root and stem. When these have formed, the original shoot can be cut off and the buds will very soon become strong shoots. It is commonly asserted that the young lucerne should not be cut too early or the plant will die. This often causes growers to err in the opposite direction. Some growers who drill the crop and hoe between the rows do not cut the lucerne in the first year until it has produced flowers. Where broadcasting is practised the necessity for

disposing of annual weeds compels earlier cutting. Where a cover crop is used the cutting must be still earlier to avoid damage to the lucerne. The evils of early cutting have been much exaggerated; where the soil is in good heart and well manured it is an advantage to cut early in the seeding year. The buds break into shoots and further buds are developed, so that a strong, bushy growth is developed in the first year.

In trials carried out by the West Sussex County Council at Chichester the usual time between sowing the seed and cutting for the first time is from 70 to 90 days, and the shorter period produces the strongest plants. The period of second cutting in the seeding year is governed by the season. In a favourable season a good second cut will be obtained in September, but whether the growth is satisfactory or not it is advisable to skim the crop with the mower to remove weeds that might run to seed. No cutting should be done later than September in any year. Moist mild seasons encourage grasses to develop. Annual meadow grass and rough-stalked meadow grass are particularly common on lucerne leys.

When the crop is established the first cut of the season will usually contain a proportion of these grasses; the first crop in each season should be allowed to grow until the lucerne is nearly at the flowering stage, when it is fit for making into hay. This will be sufficiently early to prevent the rough-stalked meadow grass from seeding, and the cutting will be at a period when it may reasonably be expected that the weather will be dry enough and hot enough to retard the growth of the meadow grasses and allow the lucerne to assert itself; the succeeding cuts of lucerne should be comparatively free from grasses. Wet weather at the time of cutting encourages the grasses, and whilst repeated cuttings of an established crop may be made in dry weather, it is better to allow the lucerne to grow to near the flowering stage in wet seasons. When it is established, lucerne can provide two cuts of hay in a season, and a third cut, which is too late for successful hay-making and is better used as forage; if cut for forage throughout the season it is possible to get four or even five cuts.

As the ley gets older the competition from the grasses increases and some means of checking the grass growth must be adopted. Fortunately an established lucerne plant can withstand somewhat rough usage by cultivating implements. Cultivators and disc harrows can be used freely and the lucerne

will thrive all the better. A few roots may be pulled out or broken off, but the damage is small; the crowns of lucerne get broken and split, but this stimulates the development of further shoots with an increase in crop.

Length of Ley.—The useful life of a lucerne ley is governed by the nature of the initial stand and by the extent to which weeds become prevalent in later years. Lucerne is a true perennial, and under favourable circumstances will last for many years, but it may be considered satisfactory if it lasts from 5 to 8 years. In this country the most profitable years are the second, third and fourth, after which deterioration is usually fairly rapid. As grass takes the place of lucerne the problem of bringing the land back into cultivation increases, and it is wise not to allow the lucerne to be quite worn out before ploughing up. A four-years' ley will give good service for three years, and lucerne might be used as a temporary ley substitute in the drier arable areas where the ordinary grasses are at a disadvantage.

Use of Green Lucerne.—Lucerne is rich in protein, and when used as green forage some food rich in carbohydrate should be fed to balance the nutrients. If it is fed to stock when it is wet and green, trouble may be experienced through cattle and sheep becoming hoven or "blown." It can be used with safety after being allowed to wilt for 24 hours. Wilting is especially important when the lucerne is to be fed to dairy cows, and reduces the risk of a slight taint in milk which sometimes occurs during the feeding of quantities of green lucerne. Pigs thrive well on lucerne cut in its young stage when the fibre content is low. If due regard is given to the tendency to "blow" cattle and sheep, lucerne is a safe and healthy food with a high mineral content, being particularly rich in lime. It may also be used in the young stages as a supplementary fodder for horses.

Making into Hay.—In this country lucerne is essentially a hay and forage crop and does not stand heavy grazing. For hay the crop should be cut just when the flowering stage is reached; delay means an increased amount of fibre and an increased loss of fine leaves. Special care is necessary in all the haymaking operations to prevent loss of the valuable fine leaves.

Modern machinery does more damage to lucerne than to grasses. The crop should be dry when cut, and after two

days the swaths should be turned over, preferably early in the day, even before the dew is off. After a further two days in fine weather the hay may be put into small cocks which are subsequently doubled or even trebled in size. Cocking preserves the colour, and the fine leaf, and the stiff stems allow drying winds to pass through the cocks. After about 10 days from cutting the hay may be safely stacked when dry. The system of cocking makes it easy to load by hand, and it is advisable to avoid hay loaders. The elevator may be used when stacking, and although there will be a good deal of leaf broken off, this falls under the elevator and can be collected and used in the same way as the commercial alfalfa meals so much used by poultry keepers.

General Conclusions.—Lucerne will not find the place it deserves in English agriculture so long as it is regarded as an exceptional crop to be grown only under special circumstances, on a limited selection of soils, and in an expensive way. On all well-drained soils, other than peaty soils, in districts with a rainfall of 30 in. or less per annum, lucerne can be a rotation crop, producing the hay required for stock, providing a supplement to summer and autumn grass, and enriching the soil for subsequent cropping. No other crop suitable to this country can produce so much protein equivalent per acre for a series of years and at a minimum of expense.

References

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ANIMAL FERMENTS

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WHETHER we like it or not, we are peripatetic breweries, for there are thousands of fermentations going on in our bodies, sometimes inside and sometimes outside the living cells. Thus there are ferments that work inside the cells of the liver, whereas the ptyalin ferment of our salivary glands, which changes starch into sugar, works in the cavity of our mouth, if we give it a chance. So is it in all animals; many different kinds of fermentation are always going on; and if it were not for the ferments there could not be the quick and smooth working that is so characteristic of life.

In a general way it may be quite truly said that ferments oil the wheels of life, but they do more than that, as we shall soon see. They are accelerators. A change of starch into sugar that would take a year by itself can take place in a minute in saliva where a ferment is present.

Part of the Secret of Life.—All ordinary animals require solid food, and those of the farm get through a good deal. The corn and hay, the turnips and oil-cake, have to be changed in the food-canal into fluid form, with smaller chemical molecules, so that it may pass through the walls of the gut into the blood-vessels and lymph-vessels, and thus be carried all over the body. This dissolving and breaking down is brought about, as everyone knows, by a succession of digestive ferments, such as *ptyalin* from the mouth-glands, *pepsin* from the glands of the stomach, and three from the pancreas or sweetbread, namely, *trypsin*, which attacks the protein part of the food and changes it into amino-acids, *amylase*, which attacks the starchy constituents and changes them into sugar (just as in malt), and *lipase*, which attacks the fatty stuffs and changes them into fatty acids and glycerine.

Here we have mentioned five animal ferments, all of great importance; and one reason for introducing them so early in this study is because everyone is familiar with the fact that the solid food must become fluid and finer in molecular grain if it is to get into the circulation and be carried through the body wherever nourishment is needed. Life could not continue in complicated animals if there were not some such process, but our present point is that to bring about in the laboratory such changes as breaking down a sugar or turning

white of egg into amino-acids, it is necessary to employ very drastic agents, such as strong acids or alkalis or high temperatures, whereas, in living creatures, similar changes take place very gently and at low temperatures. The production of heat in the animal body we have already studied,* and we noted, what everyone is familiar with in his own body, that while the heat is produced abundantly, it is at a low temperature compared with that in a test-tube or a crucible when somewhat similar chemical changes are brought about. It is also plain that strong acids or alkalis would work havoc in the delicate cells of the body. The way out that living creatures somehow discovered, and have made the most of, is to produce ferments which do astonishing things in a quiet way. This is part of the secret of life, but, unfortunately, we do not as yet fully understand the secret of ferments!

History.—No one can tell when man discovered that the juice or must of the grape, and the sweet extract or malt that seeps out from soaked grain, gave rise by a strange process of bubbling or boiling to wine and beer respectively. From the Latin *fervere*, to boil, came the word ferment; but man doubtless took advantage of natural or accidental fermentation for long ages before he knew about particular fermenting agencies, such as yeast. The process of fermentation was thought of superstitiously, or, with more insight, as somehow akin to life; but gradually men came to know that it was advantageous to keep some of the "leaven" from a good baking to use for bakings to follow, and to use some of the "barm" from one good brew to start another, and to use the same kind of grapes, unmixed with others, to secure the same quality of wine. This is clear to us now, for we know that "leaven" and "barm" and the like consist of yeast-plants that change sugar into alcohol and carbon dioxide in all the three instances mentioned. Some of the carbon dioxide is lost from the vat or in the oven, but part is usually retained, giving the beer its briskness, or the loaf its spongy lightness.

There are "wild" yeast-plants almost everywhere in the atmosphere, so that fermentations of exposed sugary material can take place anywhere, but some kinds of yeast are more effective than others; and thus long before yeast-plants were known as such, it was seen to be advantageous to keep to particular kinds of ferment-causing material, whether that was

* See the article "Animal Heat" in this JOURNAL, January, 1931, p. 966.

called "leaven" or "barm" or something else. Also of old standing was the custom of boiling wine that was to be exported, or adding some preservative, the object being to prevent further fermentation (*e.g.*, to vinegar) in the course of the voyage.

Yeast-corpuscles were detected about 1680 by Leeuwenhoek, a pioneer microscopist of extraordinary vision, but he did not recognize that they were living. That discovery was made much later, in 1837, by Cagniard de la Tour and by F. Kützing; and even then it was not appreciated. The influence of Liebig and some other great chemists, who were grappling with the chemical facts of brewing and the like, was so strong that the idea of fermentation being a *vital* process met with determined opposition.

It was reserved for Pasteur to prove up to the hilt that certain fermentations were inextricably bound up with the life of certain micro-organisms, as is alcoholic fermentation with the life of the yeast-plant, and acetic fermentation with the life of the acetic bacterium, and so on. The Pasteur school tended to the exaggeration that the life of the specific microbe was everything in fermentation; the Liebig school tended to the exaggeration that life counted for nothing. On the one hand, cases were adduced where the fermentation failed to occur when means were taken to exclude or kill the fermenting micro-organisms; on the other hand, cases were adduced of striking fermentation taking place without any demonstrable micro-organisms, as happens with bitter almonds crushed with a little water.

Thus there arose a too hard-and-fast distinction between "organized ferments" known to be living organisms, like yeast and certain bacteria, and "soluble or unorganized ferments" like the non-living, starch-fermenting "diastase" prepared from brewers' malt. In 1878, however, Kühne took a momentous unifying step by proposing the term enzyme (*en*, in; *zyme*, yeast) for *all* fermenting agencies, whether they were bound up with micro-organisms or not. The yeast-plant does its work of alcoholic fermentation because it produces within itself an enzyme or fermentative agent, but this (as Buchner afterwards showed) can be squeezed out of killed yeast and yet do its usual work. Thus the sharp contrast between living and non-living ferments broke down, the term enzyme passing into general use, to include (1) ferments like pepsin and trypsin, which are not in any essential way associated with micro-organisms, and (2) the ferments produced

by yeasts and the like. It must be carefully noted, however, that all enzymes are produced by living cells, that none are known pure, and that their chemical composition is uncertain. Ferment became a popular word, very convenient withal.

Catalysts.—No one quite understands ferments, but we cannot understand them at all unless we have first got some hold of the meaning of a larger class of bodies which are called "catalysts." All enzymes or ferments act as catalysts, but all catalysts are not ferments. Many catalysts have nothing to do with living creatures, but all enzymes are vitally produced. What, then, is the idea of a catalyst ?

Many chemical reactions are almost instantaneous, but others proceed in a leisurely way, like the very slow union of oxygen and hydrogen at ordinary temperatures, or the turning of an ester into a soap under the action of a caustic alkali. These slow-going changes can be greatly quickened by the presence of certain bodies, such as finely divided platinum in the case of hydrogen and oxygen, water being rapidly formed. A catalyst is a body that changes the rate of a normally slow-going chemical reaction. Usually, but not necessarily, the catalyst speeds up the pace ; a few are known to slow it down.

It is characteristic of catalysts, such as colloidal platinum (or traces of iron or manganese when hydrogen peroxide is oxidizing some substance), that they are not involved in the final result of the chemical change, but are found at the end unaffected. Moreover, if there is plenty of time, a pickle of catalyst is as good as a mickle. In some cases it looks as if transitory intermediate compounds were formed between the catalyst and the substances that are changing ; but in most cases Faraday's theory is probably sufficient, that there is very close condensation and compression of the reacting substances on the surface of the catalyst. The oxygen and hydrogen molecules are brought into very close quarters on the surface of the spongy platinum.

Bayliss's Model.—The late Sir William Bayliss, who greatly advanced the understanding of enzymes (see his book, *The Nature of Enzyme Action*), suggested a mechanical model which is of service in illustrating the kind of thing that catalysts (including ferments) do in altering the rate of chemical reactions.

Bayliss pictured a brass weight at the top of an inclined plane of polished plate-glass. At a certain slope of the plane

the weight will slowly slide down; but if the bottom of the weight be oiled (oil=catalyst), the rate of the fall will be greatly increased. In a general way, this is what catalysts (including ferments) do; and it will be noticed that the *form* of the energy is altered. For if the unoiled weight slides slowly down, most of the energy appears as heat due to friction against the glass; while in the case of the well-oiled weight most of the energy is present in kinetic form at the end of the fall. Similarly, in some fermentations.

Characteristics of Ferments.—Enzymes (or ferments), such as digestive juices, are "catalysts produced by living organisms"; and they have the following general properties of catalysts: (1) they do not exactly start reactions, but rather change the rate of what has already begun, usually quickening it; (2) they do not form part of the changed material or "substrate"; and (3) a little can go a long way.

Enzymes, as distinguished from catalysts in general, are marked by the following characteristics:—

(1) They are colloids of the emulsoid type; that is to say, innumerable ultra-microscopic particles or droplets of a substance, each containing more or less water of "inbibition," are suspended in a watery solution of the same substance. The device called the ultra-microscope shows discs of light refracted from the surfaces of the suspended particles, which are too small to be visible, and shows that they are in a state of vigorous "Brownian movement" (discovered by Robert Brown, the botanist, in 1827). This very interesting movement, easily seen with an ordinary microscope in a drop of water with fine coloured particles suspended in it, is due to the bombardment of the particles by the vibrating molecules of the fluid. The most important feature about the innumerable particles in a colloid is that they necessarily present an enormous total surface on which chemical and physical changes can take place. Let us think of a drop of colloid as like an archipelago of countless islets, whose coast-lines afford great opportunity for fishing and trading.

This enormous development of surface on the countless particles of the ferment-emulsion helps us to understand the power that ferments have, for they probably bring the interacting materials into very close quarters on their surfaces. One of the things that happens is called adsorption, which is a kind of surface-precipitation, well seen (in a simple case) when charcoal is added to a weak solution of a dye like methylene

blue, the result being so great a capture of the dye by the interstitial surface of the charcoal that the fluid passes through clear.

(2) Enzymes are usually very specific in their action, which could not be said of an inorganic catalyst like spongy platinum. The metal can quicken various processes, but an enzyme helps on the changes in one kind of substrate (or material) and in one only. It may, however, help to quicken a breaking down and in other conditions a corresponding building up of molecules, for the action of enzymes is characteristically *reversible*. It should also be noted that enzymes are very sensitive to external conditions, such as temperature and acidity; and some *cannot* "leaven the whole lump" for they are destroyed or in some way smothered by an accumulation of the material they help to produce.

(3) There seems good reason to believe that enzymes are definite chemical substances, and not merely properties of substances; but their chemical structure has not been worked out. The negative statement can be made, that they are *not* proteins. Those that have been obtained in purest form are amylase (concerned in changing starch into sugar), invertase (inverting sugar), lipase (attacking fats), pepsin (digesting proteins) and peroxidase (decomposing hydrogen peroxide). Some investigators, like Willstätter, believe that an enzyme consists of (1) a colloid carrier, on which adsorption occurs, and (2) a more subtle substance which is the actual catalyst. All enzymes are formed by the living matter of cells, and the stage before they acquire their active properties is called "zymogen." It usually takes the form of very minute granules. The most recent refinements of the theory of ferments will be found in a newly published book by J. B. S. Haldane (*Enzymes*, Cambridge University Press, 1930). He favours the view that in addition to the physical adsorptions, there is a transitory union between enzyme and the materials on which it operates.

Important Animal Ferments.—It is understood, then, that ferments or enzymes are of vital importance because they quicken the rate of chemical changes that would go on very slowly of themselves. The ferments have their finger in many a pie, and this is what we now wish to illustrate.

(a) *Ferments concerned in Digestion.*—As we have mentioned, digestion means dissolving the food and also making it more readily diffusible by breaking down large molecules into

smaller ones, which pass more readily through the lining membranes of the intestine into the blood-vessels and the lymph-vessels. Most digestive ferments help in a process of *hydrolysis,* which means that water is added to the material or substrate, and a splitting up follows. To each molecule of the food (in the case of digestion) a molecule of water is added, and then the combined molecule splits into two. The cleavage products may be equal or unequal in molecular size, and one or both of them may be combined again with more water, the splitting process being then repeated. The result of this may be that protein molecules are broken down into smaller amino-acid molecules, so completing the digestion. Similarly, starch molecules may be broken down into sugar (glucose), or fat-molecules into fatty acids and glycerine. Among the hydrolytic digestive ferments we may mention: amylase or ptyalin from the salivary glands, changing starch into maltose sugar; amylase or amylopsin from the pancreas or sweet-bread, doing the same; invertase changing sucrose into two other sugars—dextrose and levulose; lipase, from the pancreas, changing fats into fatty acids and glycerine, which pass into the lymph-vessels; pepsin from the stomach glands, changing proteins into peptones and the like; trypsin, from the pancreas, changing proteins into amino-acids and similar substances; erepsin changing peptones into amino-acids.

In very simple animals, like zoophytes and some worms, the solid particles of food are in part engulfed by the cells lining the food-canal, and then digested within them by intracellular ferments; in all other cases the digestive ferments are liberated into the cavity of the gut and do their work there, the dissolved and simplified products being subsequently absorbed.

(b) *Coagulating Ferments.*—A few enzymes are concerned in binding together, rather than in splitting up. They are factors in coagulation, and may be illustrated by the curdling ferment called rennase, from the calf's stomach or from the pancreas, which has to do with changing the caseinogen of milk into casein. This rennase is regarded by some as the same as pepsin.

We have all watched the clotting of the blood that has flowed from a wound in our hand. In this very interesting and intricate process part of the fluid of the blood sets in a jelly, traversed and bound together by crystalline threads of fibrin. Some investigators rank among enzymes a substance called thrombin, which has to do with forming the fixed fibrin out of a soluble protein, fibrinogen.

(c) *Ferments that Promote Oxidation.*—Widely distributed in animal tissues are enzymes that assist in oxidizing or burning away various substances. They are called oxidases. Somewhat similar are the peroxidases that act on peroxides; and one of the most important of enzymes is the catalase of the green leaf that helps in the production of oxygen and water from hydrogen peroxide.

A widely distributed animal ferment, which we mentioned in our study on Animal Pigments in the February number of this JOURNAL, is tyrosinase, which promotes the oxidation of the amino-acid tyrosin. On the opposite side, but few in number, and hardly requiring a separate group in this simple survey, are the reducases that help in de-oxidation or reduction.

(d) *Deaminases.*—This is a very unfamiliar word, but it is the name of a very important group of animal ferments, whose general rôle is not difficult to understand. All ordinary animals require protein food; this is broken down (with the help of digestive ferments) into amino-acids; these are used in part to replace the broken-down protein building-stones of the living matter, or to add to them if there is growth; but there is usually a surplus of amino-acids, and these are dealt with in the liver. The nitrogen in an amino-acid is in the form of an amino-group (NH^2), and this is split off (de-aminated) in the liver to form ammonia, which in turn (being a cell-poison!) is rapidly combined with carbon dioxide to form ammonium carbonate. By removal of water, probably in the liver cells, this is changed into urea, which is got rid of in the urine. We see, therefore, a deeper meaning in the familiar pool of urine from horse or cow.

To complete our outline of a fascinating story, we may notice in passing that the nitrogen-free residues of the de-aminated amino-acids, which have a carbohydrate or a fatty character, are oxidized to yield energy to the body. Our particular point, however, is that certain ferments assist in the fundamentally important process of de-aminating; and these are called "deaminases." When the standing urine, with which we are all familiar, begins to give off ammonia and carbon dioxide, another ferment, called urease, is assisting in the breaking down of urea. And so we must conclude our sampling of the ferments that play so important a part in so many corners of animal life. We have said enough to show that life would be a slow business without ferments.

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A DORSET CHEESE-MAKING AND MILK-SELLING FARM

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Descriptive.—This story of a Dorset cheese-making and milk-selling farm for the six years 1924-30 is based on detailed accounts kept by the Agricultural Economics Department of the University of Reading. It is intended to add to the knowledge, at present somewhat scanty, of the economic position of farm cheese-making in this country.

The farm is situated on a slope of the southern extension of Salisbury Plain, overlooking the Vale of Blackmore, the "vale of little dairies." It is a grassland dairying holding of approximately 150 acres, only 14 acres being under arable cultivation. The predominant enterprise is a combination of cheese-making in summer with milk-selling in winter. The feeding of pigs forms an essential complementary activity; and the few arable crops grown dovetail into the main enterprise, both in their demands on the labour force and as a source of home-grown food and litter for the dairy herd.

The dairy herd consists, on the average, of 42 heavy-milking dairy Shorthorns. The best heifer calves are kept to replenish the herd, but some purchases are also made; about 20 per cent. of the herd are replaced each year. The majority of the cows calve in spring and early summer. A high average milk yield of approximately 700 gallons per cow per annum was obtained over the six years. Approximately 66 per cent. of the total milk supply was produced in the six summer months, April-September. In most years this period is that of cheese-making, which is usually from about mid-April to the end of September. Current conditions, however, always affect the length of the cheese-making period. Thus, in 1928 cheese-making was postponed to the first week in May, while in the last season (*i.e.*, 1929) it was commenced on the first of April because the distributors had decided to pay summer prices for April milk in that year. The method of disposal of the total milk output for the six years is shown in Table I.

TABLE I.—DISPOSAL OF TOTAL MILK SUPPLY, 1924-1930

	Gallons	*Per cent.*
Sold during "Winter" Period ..	73,176	42·3
Sold during "Summer" Period ..	8,137	4·7
Used by Family and Labourers ..	2,092	1·2
Made into Cheese	89,427	51·8
TOTAL	172,832	100·0

In the foregoing and following tables, the "summer" period corresponds to the period of cheese-making, the "winter" period covering the remainder of the year.

Just over one-half of the total milk produced during the six years was made into cheese, the remainder (with the exception of a small quantity used in the home) being sold wholesale in liquid form. There were slight variations in the proportions from year to year, depending on the length of the cheese-making season. During the cheese-making season very little liquid milk is sold, apart from small quantities occasionally to "accommodate" the local milk factory. On no account is any milk allowed to enter the "surplus" milk market.

The Major Problem of Management.—The major problem of management on this farm is the maintenance of an optimum balance between summer cheese-making and winter milk-selling. In reality the problem is two fold: (*a*) to strike the balance between summer and winter milk production, and (*b*) to decide on the best method of utilizing the summer milk supply. This is also the problem that confronts a large number of milk producers in Dorset, as well as in other areas where farm cheese-making is practised. In solving this problem it is necessary to consider several factors that enter into the relative advantages of cheese-making and milk-selling as a means of disposing of the produce of the dairy herd. In particular the following may be enumerated :—

(1) *The Relative Costs of Producing Milk for the Two Objectives.*—Inasmuch as cheese-making is usually dependent on summer milk production, while milk-selling usually demands a more even production all the year round, this resolves itself largely into the question of the relative costs of summer and winter milk production.

(2) *The Relative Gross Returns per Gallon of Milk to be expected from each Method of Disposal.*—This is essentially a question of prices (*a*) of liquid milk in its various categories, (*b*) of cheese, and (*c*) of pigs as a means of utilizing the by-product whey.

(3) *The Relative Net Returns per Gallon of Milk to be obtained from each Method of Disposal.*—In addition to the above two considerations, this involves a comparison of the costs entailed after the milk has been produced, *i.e.*, the costs of processing and marketing of cheese and of marketing liquid milk respectively.

Costs of Producing the Milk Supply.—The all-year costs of milk production for each of the six years are shown in Table II.

TABLE II.—COSTS OF MILK PRODUCTION, 1924/5 TO 1929/30

	Pence per gallon
1924/25	10·51
1925/26	11·65
1926/27	11·55
1927/28	9·24
1928/29	9·12
1929/30	12·45
Six Years' Average	10·76

Having regard to the high milk yields, these costs are not excessive. This is partly due to the fact that most of the output is produced off grass, and partly to very careful management throughout, both in the feeding and in the general supervision of the herd. The lower costs per gallon shown for 1927/28 and for 1928/29 were due to an appreciable increase, in these two years, in the surplus obtained from young stock, which exercised a salutary influence in reducing the final costs of milk production. The comparatively high costs shown for the last year of the period illustrates the serious effect of a summer drought on grassland dairying. The scorched pastures of 1929 forced the farmer to buy considerable quantities of foodstuffs, and even then the milk yield suffered. Thus, purchased foods per cow increased from £10 18*s*. 2*d*. in 1928/29 to £14 3*s*. 2*d*. in 1929-30, an increase that was reflected in a rise of over 3*d*. per gallon in the final costs of production.

It is very difficult, if not impossible, to make a valid comparison of the costs of producing summer milk and winter milk on the same farm. Indeed, on the same farm summer and winter milk production are so interdependent as to make any attempt at such a comparison very artificial. It is reasonable to assume, however, that on this farm an increase in the proportion of milk produced in winter would have a tendency towards increasing at least three items of cost, viz.: (1) feeding stuffs, (2) labour, (3) depreciation; since a greater reliance would probably have to be placed on purchasing for the maintenance of the herd were milk-selling to become the primary object. No attempt has been made in the accounts to obtain a separate figure for the costs of producing summer and winter milk. However, in so far as the costs actually incurred during the winter and summer periods respectively may be considered as approximating to the costs of producing winter and summer milk, it is of some interest to make such a comparison provided its limitations are fully realized. The figures are given in Table III.

TABLE III.—Summer and Winter Costs

	Winter costs per gal. of milk produced during six winter months	*Summer costs per gal. of milk produced during six summer months*	*All year costs per gal.*
	Pence	*Pence*	*Pence*
1924/25 ..	15·23	8·57	10·51
1925/26 ..	15·57	9·62	11·65
1926/27 ..	14·89	9·58	11·55
1927/28 ..	14·00	6·95	9·24
1928/29 ..	12·53	8·48	9·12
1929/30 ..	15·07	11·22	12·45

In arriving at the foregoing figures, the prime costs of foods, grazing and labour incurred during each period were ascertained from the records. The overhead dairying costs, *i.e.*, herd depreciation, veterinary surgeon and medicines, etc., have been apportioned on a per gallon basis. The proportion of farm rent and overheads have been apportioned 1 : 4 as between winter and summer, on the assumption that this roughly corresponds to the ratio in which the effective area of the farm was used in each period. It must be emphasized that this method of arriving at summer and winter milk costs is largely arbitrary, and has been used in the present article only for the purpose of making plainer the subsequent discussion.

In view of the somewhat arbitrary nature of these figures it would not be wise to enlarge on them. The comparatively low cost per gallon shown for the summer of 1927 is the result of the high yield attained. Both summer and winter costs are shown to be inflated in the last year as a result of the unusual weather conditions.

Gross Returns per Gallon from Milk-Selling and from Cheese-Making.—The gross return to be obtained from the two methods of milk disposal is, of course, primarily a question of the relative prices of milk and of cheese. In Table IV the average gross returns obtained per gallon for liquid milk sold and for milk made into cheese are shown side by side.

TABLE IV.—GROSS RETURNS PER GALLON FOR LIQUID MILK SOLD AND FOR MILK MADE INTO CHEESE, 1924–1930

	"Winter" milk sold	"Summer" "accommodation" milk	Milk made into cheese
	Pence	Pence	Pence
1924/25 ..	14·1	11·0	10·5
1925/26 ..	13·8	15·0	11·7
1926/27 ..	11·7	11·8	9·2
1927/28 ..	12·0	—	11·3
1928/29 ..	13·4	14·0	12·8
1929/30 ..	13·9	12·5	10·1

(*a*) *Gross Returns from Sales of Liquid Milk.*—The milk sold during the winter period is sold under a six months' contract to a neighbouring milk factory; the average prices obtained are given in the first column of Table IV. After due allowance is made for rail charges, etc., these prices are about 2*d.* per gallon less than the corresponding London prices ruling under the Milk Contract Scheme of the National Farmers' Union. (In all years the price obtained for October milk was about 1*d.* per gallon less than that obtained in the other five winter months.) On the other hand the small quantities of "accommodation" milk sold in summer usually command higher prices than those prevailing in the London Market. The market for "accommodation" milk is, however, strictly limited, and offers hardly any scope for exploitation.

(*b*) *Gross Returns from Milk made into Cheese.*—The figures given in Table IV as the average gross return per gallon of milk converted into cheese have been obtained by dividing the total returns from cheese sold by the quantity of milk used in its production. No account has been taken of the value of the whey. It follows, therefore, that these figures depend entirely on the prices obtained for cheese, since the quantity of milk used per pound of cheese made has hardly varied

throughout. The cheese is sold to a cheese factor, and the actual prices per cwt. obtained for each consignment sold during the six years are shown in Table V, the month of sale also being stated.

TABLE V.—Cheddar Cheese Prices, 1924–1930
(Shillings per Cwt.)

1924 *Season*		1925 *Season*		1926 *Season*	
June	80/–	May	112/–	June	84/–, 93/–
July	92/–	September	126/–	September	95/–
August	100/–	November	132/–	October	95/–
September	103/–	February	130/–	January	96/–
October	110/–			March	96/–
Average	98/3	*Average*	121/8	*Average*	95/7

1927 *Season*		1928 *Season*		1929 *Season*	
June	103/–	August	122/–	June	93/–
August	111/—	September	126/–	August	103/–
October	114/–	October	132/–	September	103/–
November	121/–, 122/–	January	133/–	November	106/–
				January	110/–
				February	112/–
Average	114/6	*Average*	128/4	*Average*	103/9

These figures supply an interesting commentary on the returns from cheese for the period under review. Unsatisfactory prices were obtained for the produce of 1924, of 1926 particularly, and also of 1929. Comparatively good prices were obtained in 1925, 1927 and 1928. It is interesting to note that the improvement which set in after 1926 synchronized with the commencement of the activities of the Cheddar Cheese Federation, of which the farmer has been a member from the start. In so far as the poor prices of 1929 were the result of a reaction from the high prices of the previous year, they were also indirectly influenced by the activities of the Federation. First-grade cheese is generally produced, except when physical conditions render this very difficult. On the whole the prices obtained compare favourably with the average prices for first quality Cheddar cheese officially quoted on the Bristol Market.

A comparison of the gross returns per gallon obtained from both methods of utilizing the milk is only a rough measure of their relative advantages. Nevertheless, it is worth noting that, with the exception of the two years, the gross returns per gallon obtained from milk made into cheese improved actually and relatively during the period. The improved position of cheese-making in this instance is due partly to the grading and advertising activities of the Cheddar Cheese Federation. Provided that the set-back of the last season can be overcome, and that these activities are developed, it is reasonable to

expect, other things being equal, that the Federation will continue to exert a beneficial influence on the prices of at least first quality cheese. On the other hand, considering the state of development of milk marketing organization, it is difficult to justify any optimism regarding the future of liquid milk prices. The gross returns from milk made into cheese given in Table IV would have been higher had a value been included for the by-product whey. It is generally considered that, on the basis of composition, the value of whey as a food may be put at between ½*d.* and 1*d.* per gallon. In the accounts, however, no value has been put on the whey, since on the farm the feeding of pigs with whey constitutes virtually a joint-enterprise with cheese-making.

Net Returns per Gallon from Milk Production as a Whole.—The net returns from milk production as a whole are obtained by deducting all costs—costs of milk production, delivery costs, and costs of cheese-making—from the total returns.

The net returns for each of the six years are as follows :—

	Net returns per gallon
	Pence
1924/25	1·11
1925/26	0·30
1926/27	−1·77
1927/28	1·28
1928/29	2·79
1929/30	−1·40

These results supply some indication of the incidence of the post-war depression on the fortunes of this fairly typical west-country dairying holding. The net return of 1·11*d.* per gallon obtained in 1924/25, was followed in the next two years by increasingly unfavourable returns until, in 1926/27, milk production was carried on at a loss of 1·77*d.* per gallon. In 1927/28, and particularly in 1928/29, higher milk yields, lower costs, and better prices (particularly for cheese) all resulted in considerable improvement, the net return for 1928/29 being 2·79*d.* per gallon. This satisfactory result received a severe set-back in the last year of the period, the combined effect of the drought and the fall in cheese prices resulting in a loss of 1·40*d.* per gallon.

Cost of Cheese-Making.—In arriving at the net returns shown in the preceding paragraph two post-production costs, not hitherto considered, have been introduced, viz., collection charges for milk sold and the costs of cheese-making. The collection charges in the case of milk-selling amounted to an extra cost of ½*d.* per gallon on all milk sold at liquid prices, *i.e.*, for all winter milk sold.

The costs of cheese-making per gallon of milk used were much the same for the first five years of the period. In 1929, however, cheese-making costs were 40 per cent. higher than the average of the previous years. This was due to the dry season—the quality of milk handled being comparatively much smaller, while there was no corresponding reduction in the labour entailed. Thus, while the costs of cheese-making in 1929 were 1.25*d.* per gallon of milk used, the corresponding average figure for the previous five years was only 0·89*d.* per gallon—a figure slightly less than the 1*d.* per gallon sometimes given as the average cost of cheese-making. The various items making up the costs of cheese-making are set out in Table VI, the average figures for the first five years of the period only being used.

TABLE VI.—Costs of Cheese-making. Five Years Average, 1924–1928

	Pence per gallon of milk used	*Per cent.*
Labour	0·67	75·3
Upkeep of Plant and Utensils	0·12	13·5
Cheese Cloths	0·06	6·7
Rennet, Salt and Caustic Soda ..	0·03	3·4
Sundries	0·01	1·1
Total	0·89	100·0

Apart from labour, which accounted for over 75 per cent. of the total costs, the costs of cheese-making per gallon of milk are seen to be almost negligible. On this farm, where all the work on the cheese is done by the farmer with the assistance of the female members of the household, even the labour cost may be considered an item of theoretical importance only. The next biggest item of cost in cheese-making is the upkeep of the special plant and utensils required, such as cheese-vat and accessories, cheese-moulds, presses, cooler, cheese-store fixtures and certain other sundry items. The capital value of all this equipment amounted to an average of approximately £87, making the charge for depreciation and upkeep to be just over one-eighth of a penny per gallon of milk utilized. The cost of cheese-cloths amounted to only 0·06*d.* per gallon, and the costs of materials, such as rennet, salt and caustic soda, used in the process added a further 0·03*d.* per gallon. Most of the item "sundries" represents payment for membership of the Cheddar Cheese Federation and for grading fees.*

* No charge has been included for fuel, as only dead timber from the farm has been used for the purpose.

Net Returns from Winter Milk-Selling and from Summer Cheese-Making.—It is necessary now to distinguish between the net returns per gallon from each of the two methods of disposing of the milk supply. In the case of liquid milk sales the net returns are obtained by deducting the sum of the total costs of milk production and collection charges from the gross receipts. The net returns from milk made into cheese are similarly obtained by deducting the sum of the total costs of milk production and the extra costs of cheese-making from the gross receipts. A real difficulty arises, however, in deciding what figure is to be taken as representing the cost of milk production in each case. Is it better to take the actual all-year cost figures given in Table II, or is it better to use the estimated seasonal cost figures given in Table III ? When the problem is looked at from different angles, reasons can be given for using, under different circumstances, each of these two cost figures. For this reason the results obtained from both methods of calculation are set out in juxtaposition in Table VII.

TABLE VII.—NET RETURNS PER GALLON FROM WINTER MILK-SELLING AND FROM SUMMER CHEESE-MAKING, 1924-1930

	(1) *Using all-year costs of milk production*	
	Milk-selling	*Cheese-making*
	Pence	*Pence*
1924/25	3·10	−0·75
1925/26	1·67	−0·73
1926/27	−0·36	−3·24
1927/28	2·28	1·12
1928/29	3·78	2·71
1929/30	1·05	−3·60
	(2) *Using estimated seasonal costs of milk-production*	
	Milk-selling	*Cheese-making*
	Pence	*Pence*
1924/25	−1·62	1·20
1925/26	−2·25	1·30
1926/27	−3·70	−1·27
1927/28	−1·48	3·41
1928/29	0·37	3·33
1929/30	−1·67	−2·37

The two very different stories told in this Table supply ample proof (if any such proof were necessary) of the extreme care with which figures purporting to distinguish between the costs and the returns of joint products must be used. According to the first method of calculation winter milk-selling appears to be distinctly superior to summer cheese-making throughout, while, by the second method, the position is reversed. The

true situation probably lies between these two sets of figures. If the major object of the dairy enterprise is considered to be cheese-making, the estimated summer costs are probably the best to adopt. On the other hand, if the major object is taken to be milk-selling there is probably more justification for using the all-year costs of milk production. If this reasoning be accepted, then the best comparison is probably obtained by taking the first set of figures shown in the Table for milk-selling, and the last set of figures for cheese-making, when the results from both are seen to be much more equally poised for the whole six-years period.

From the farmer's point of view it is, fortunately, possible to approach the problem in a different way. Having regard to the physical conditions on this particular farm, there are reasons for believing that the farmer has developed winter milk-production to its economic limits. The natural characteristics of the farm will always result in a comparatively big summer output of milk, and, provided the possibilities of winter milk production are fully exploited, the problem of disposing of this summer output to the best advantage still remains. The only alternative to cheese-making open to the farmer during the period was the sale of bulk-milk. In order to give the same return as the cheese, this bulk-milk would have had to be sold at a net price at least equal to the gross return per gallon received for the milk made into cheese less the costs of cheese-making. In other words the summer milk would have had to be sold at the following prices :—

	Per gallon Pence
1924	9·76
1925	11·05
1926	8·31
1927	10·36
1928	11·83
1929	8·85

Now the wholesale London price for summer milk under the N.F.U. scheme was approximately 12*d.* per gallon throughout the period. A deduction of about 2*d.* per gallon from this figure must be made to arrive at the corresponding local prices which the farmer could have obtained. Moreover, since a big percentage would have to be disposed of at surplus prices, the average price of summer milk would be considerably further reduced. It is clear, therefore, that in each year, except possibly in 1926 and in 1929, cheese-making was the more economical method for the disposal of the summer milk supply.

ns from Pig Feeding.—There still remain to be con-
the returns from pig feeding, since these bear a direct
. to the returns from dairying, and in particular to the
from cheese-making.

ɔig policy pursued is partly one of breeding and partly
buying in batches of cheap stores for rapid fattening.
the pigs are sold at 6½ to 9 score dead weight. Pre-
it was the custom to curtail the pig enterprise as soon
ɔheese-making season was over, but during the last two
a more even production has been attempted. By
ination in the purchase of stores, and by careful purchase
ɔ of foods, the farmer appears to be successful in ex-
; the potentialities of the pig market.

ɜurplus (*i.e.*, the excess of returns over prime costs and
ation) obtained from pig feeding during the period
ɔd to a total of £625. This six years' period more than
a complete cycle of pig prices, so that this result is
ant. It shows that over the six years pigs have, on the
supplied a useful surplus towards meeting the general
verheads. Since the pig enterprise is largely in the
ɔf a quasi-factory undertaking, making but little demand
farm overheads, this surplus may be regarded as
: less clear profit.

ing this surplus to the results of the dairying enterprise,
be said that pigs have proved a profitable means of
g of the by-product whey. In order to show the exact
ship, it is necessary to distinguish that part of the
obtained during the period of whey feeding. Although
t possible to discriminate absolutely between the two
ɔs (since summer and winter pig feeding are to a certain
lso joint enterprises) the following figures approximate
to the surplus obtained from whey-fed pigs :—

	£
1924/25	58
1925/26	169
1926/27	37
1927/28	31
1928/29	134
1929/30	130
	£559

he whole period approximately 73,500 gallons of whey
to the pigs. The surplus obtained, therefore, has been
equivalent to a return of 1·8*d.* per gallon of whey fed,
ɔximately 1.5*d.* per gallon of milk used for cheese-

making—a figure that would appear to justify the popular belief that the whey pays for the costs of cheese-making. It is important that this should be considered in any comparison of summer cheese-making and winter milk-selling.

Summary.—(1) In so far as this holding may be regarded as typical of the grassland dairying holdings of the West Country, not too conveniently situated for markets, the results shown may be taken as some indication of the incidence of the depression on this kind of farming.

(2) Practically the whole of the activities of the holding centre round a combination of cheese-making, milk-selling and pig-feeding, so that to a large extent the results reflect the relative advantages of this three-fold enterprise.

(3) In so far as it is possible to analyse the results of a joint enterprise, it has been shown that the relative returns from winter milk-selling and from summer cheese-making have been fairly equally poised over the whole period. In 1926/27 it was impossible to dispose of the milk supply at a profit by either method ; but in the next two years much better results were obtained from both methods. The dry summer of 1929 had very serious effects, and once again both processes were carried on at a loss.

(4) With the possible exception of two seasons, the policy of making cheese from summer milk has resulted in a better return than could have been obtained if the summer milk had been sold in liquid form.

(5) Over the whole period pigs have proved a fairly satisfactory means for disposing of the by-product whey, although, within the period, the results have fluctuated in conformity with the cycle of pig prices.

(6) Taking into account the natural characteristics of the farm, and its situation for markets, the combination of cheese-making and winter milk-selling appears to have provided a fairly satisfactory basis for the system of farming pursued. The adverse change in the prices of cheese ruling in the last season, if it continues, will, however, greatly accentuate the problem of the economic utilization of the summer milk supply.

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VARIETIES OF PEAS FOR CANNING

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THE pea-canning industry has developed very rapidly in England during the last three years, and, as it will be necessary to plant out a considerable acreage to keep pace with the increased demand from the canning factories, it is of great importance to ascertain what are the most suitable varieties of peas for this purpose. The varieties grown must give a satisfactory crop, must ripen uniformly so as to give a good yield when vined, and must produce a pea that has certain desirable qualities when canned.

Tests on the suitability of a large number of varieties of peas for canning have been carried out at Campden over a period of five years. The results of the earlier experiments were set out in a paper published in the Annual Report of the Long Ashton Research Station for 1927, but the present method of preserving the colour was not used in those tests.

During the season 1930, extensive field trials were carried out by Mr. J. C. Wallace at the Kirton Agricultural Institute, and by Mr. F. Rayns at the Norfolk Agricultural Station. The results of the tests at Kirton, showing the cropping of the different varieties and the yield obtained on picking, are dealt with by Mr. Wallace in the article following.

As each batch of peas was picked, a certain quantity—generally 40 lb.—was despatched to Campden, where they were shelled carefully and thoroughly in a small shelling machine, graded and canned. The yield of peas from pods and the quantity of peas passing through the various sizes of sieve were noted.

Yield of Peas.—If the peas are picked and not vined, it is obviously important that the canner should know whether the particular variety of pea he is buying is one that may be expected to give a good yield of peas from pods.

It is not easy to make an accurate comparison of the different varieties in this respect, as the degree of maturity when the peas are picked has a very marked influence on the yield. Certain of the larger varieties may yield 30 per cent. of peas when not quite mature, but if the peas are allowed to swell out and ripen fully, the yield may rise to 50 per cent. It is not advisable to allow the peas to reach this state—the yield may be large, but the quality is not good, the peas easily become starchy in the can, and the main bulk

constitutes a large grade which does not command such a good price as the smaller grades. In addition, pods that have been allowed to reach their full size are more difficult to shell by machinery, more peas are damaged, and there is a greater wastage of peas passing through the machine unshelled.

Certain varieties yield a high percentage of peas from pods, but the pods are small and this entails more labour in picking, and consequently an additional cost to the grower. In experiments at Campden it was found that the variety Chemin Long grown in the gardens of the Research Station generally yielded a high percentage of peas from pods, but the latter were small and so the advantage of a high yield was counteracted by additional costs of picking and handling.

Of the main crop varieties, Lincoln, Yorkshire Hero and Prince of Wales generally give a good yield, while British Lion has shown consistently low yields during the years it was tested. The following list shows the yields of peas from pods obtained from different varieties grown at Campden during the past few years :—

	Yield of peas from pods, per cent.				
Variety	1925	1927	1928	1929	1930
Alaska	33	27	27	30	28
Sangster No. 1. ..	37	31	30	—	—
Annonay	36	40	32	—	29
Chemin Long No. 4 ...	40	42	37	—	35
British Lion	—	24	25	25	—
Little Marvel ..	—	—	39	36	36
Lincoln	43	37	36	36	29
Yorkshire Hero ..	—	39	38	38	—
Prince of Wales ..	—	38	37	36	—
Senator	—	38	37	36	—

The percentage of the various sizes of peas separated in the grading machine is also of importance, as the smaller grades of canned peas generally sell at a better price than the larger grades. The majority of the early peas, such as Alaska, Sangster No. 1 and Sharpe's First Early White, pass completely through the large 29 sieve, but most are retained by the 27 and 24 sieves. Chemin Long, Gontier Blanc and Delicatesse are also small varieties, while amongst the large peas may be classed Yorkshire Hero, Prince of Wales, Little Marvel, Senator and Charles the First.

The relative quantities of the various grades obtained from the different varieties tested in the 1930 experiments are shown in the table, pages 40, 41, but it should be borne in mind that these ratios vary greatly from season to season, and even from day to day, as the peas are maturing. This table also gives the yields of peas to pods given by each variety, and the appearance of the canned product.

Date	Variety	Grown	Yield peas from pods	Grades				Remarks
				29	27	24	Smalls	
1930			Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
July 1	Alaska	Campden..	21	nil	12	64	24	Good colour and shape.
,, 7		Campden..	34	20	58	15	7	Good colour and shape.
,, 8		Kirton (S)	25	5	24	45	26	Very good.
,, 8		Kirton (J)	27	nil	20	58	22	Very good.
,, 8		Norfolk ..	41	7	38	44	11	Quite good; rather too mature.
July 4	Sangster No. 1 ..	Norfolk ..	28	nil	24	56	20	Good colour.
,, 8		Kirton ..	29	18	31	37	14	Very good.
July 1	Sharpe's First Early White	Campden..	21	nil	48	37	15	Good colour.
,, 7		Campden..	35	32	40	22	6	Good colour.
,, 8		Kirton ..	29	16	34	40	10	Good colour.
July 1	Annonay	Campden..	24	nil	15	72	17	Quite good.
,, 7		Campden..	32	nil	38	44	18	Quite good.
,, 8		Norfolk ..	38	5	38	47	10	Good colour; rather uneven shape.
,, 17		Kirton ..	34	37	42	16	5	Moderate. Too mature when canned.
,, 17		Kirton ..	31	24	40	26	10	Moderate. Too mature when canned.
July 8	Gontier Blanc ..	Norfolk ..	37	4	41	45	10	Good, but too mature when canned.
,, 12		Kirton ..	29	12	36	40	12	Very good.
July 7	Witham Wonder ..	Campden..	30	53	21	21	5	Poor appearance.
,, 17		Kirton ..	41	52	20	18	10	Poor appearance.
July 8	Kelvedon Wonder ..	Norfolk ..	34	65	18	12	5	Only moderate. Peas brownish-green c'lour.
,, 12		Kirton ..	31	54	22	15	9	Only moderate. Peas brownish-green c'lour.
July 12	Fenland Wonder ..	Kirton ..	33	49	29	14	8	Only moderate. Peas brownish tint.
,, 17		Campden..	26	46	24	20	8	Only moderate. Peas brownish tint.
July 11	Thomas Laxton ..	Norfolk ..	39	82	9	5	4	Quite good. Olive tint.
,, 16		Kirton ..	36	53	36	8	4	Quite good. Olive tint.
July 11	Chemin Long.. ..	Norfolk ..	32	nil	47	41	12	Good colour and shape.
,, 12		Campden..	35	nil	32	43	25	Good colour and shape.
,, 16		Kirton (S)	31	nil	42	44	16	Very good.
,, 16		Kirton (J)	26	nil	53	21	26	Good.

July 8	Meteor	Norfolk ..	42	50	32	11	7	Rather poor. Brownish-green colour.
„ 17		Kirton ..	39	65	22	9	4	Rather poor. Brownish-green colour.
July 8	French Canner ..	Norfolk ..	43	24	42	23	11	Moderate. Canned when too mature.
„ 16		Kirton (S)	31	9	52	33	8	Rather poor. Brownish-green colour.
„ 19		Kirton (J)	39	53	28	9	5	Very good colour.
Aug. 5		Campden..	28	20	52	18	—	Good appearance.
July 11	Little Marvel ..	Norfolk ..	38	72	20	8	—	Moderate. Brownish tint. Large.
„ 17		Kirton ..	34	71	15	9	5	Moderate. Brownish tint. Large.
July 19	Early Kenilworth ..	Kirton ..	42	60	31	9	—	Quite good. Slight olive tint.
„ 22		Campden..	28	35	33	23	9	Moderate. Olive tint.
July 18	Delicatesse	Norfolk ..	28	8	68	25	9	Good appearance.
„ 24		Kirton ..	30	20	70	10	—	Very good colour, flavour, and shape.
July 18	Mercury	Norfolk ..	42	65	38	7	—	Moderate. Slight brown tint.
„ 22		Kirton ..	46	65	30	5	—	Moderate. Olive tint.
July 18	Lincoln	Norfolk ..	36	62	20	11	7	Good appearance.
„ 24		Kirton (J)	37	76	18	6	—	Quite good. Slight olive green tint.
„ 24		Kirton (S)	32	51	39	6	4	Quite good. Slight olive green tint.
Aug. 5		Campden..	29	34	56	10	—	Quite good. Slight olive green tint.
July 18	Prince of Wales ..	Norfolk ..	33	52	32	12	4	Good colour.
„ 24		Kirton ..	34	81	10	9	—	Good colour.
July 18	William the Conqueror	Norfolk ..	33	48	31	15	6	Rather poor. Brownish tint.
„ 24		Kirton ..	40	15	73	12	—	Rather poor. Too mature when canned.
July 19	White Brunswick ..	Kirton ..	42	41	32	21	6	Uneven colour. Too mature when canned.
July 19	Senator	Kirton ..	35	49	34	17	—	Good colour. Large.
Aug. 5		Campden..	30	80	14	6	—	Very good colour.
July 19	White Admiral ..	Kirton ..	35	27	34	25	14	Quite good.
Aug. 21		Campden..	39	27	29	35	9	Very good.
July 19	Green Admiral ..	Kirton ..	40	6	58	26	10	Quite good.
„ 21		Campden..	39	18	52	23	7	Very good.
July 18	Yellow Admiral ..	Norfolk ..	33	13	38	39	10	Good appearance.
„ 19		Kirton ..	36	28	32	31	9	Quite good. Too mature when canned.
Aug. 21	Dwarf Canner ..	Campden..	28	nil	10	79	11	Very good colour.
July 24		Kirton ..	23	nil	15	75	10	Good colour.
Aug. 13	Charles the First ..	Campden..	47	88	8	4	—	Very good.

Peas from certain varieties such as Mercury, Meteor, British Lion, Witham Wonder and Fenland Wonder tend to turn a rather dark brownish colour in the can. This colour cannot be masked, and the resulting product has an olive green tint instead of a bright natural green appearance.

As far as the general appearance of the canned product is concerned, a clear natural green tint is the most important feature. Other essential points are the shape, firmness, grading, clarity of covering liquid and flavour. Varieties vary considerably as regards the shape of the peas—Pioneer, for example, is rather a large, poor-shaped pea, and is not very attractive when canned. The splitting of peas is generally due to incorrect adjustment of the shelling machine, but variation in the size of pod and in the maturity of the peas makes it difficult to shell peas perfectly in machines which have to deal with very large quantities. Splitting during the blanching process occurs in certain varieties, notably Senator. The clarity of the covering liquid is very important, as a cloudy or starchy brine detracts very greatly from the appearance of the product. Cloudiness and starchiness are generally due to the peas having been allowed to mature fully before canning, instead of their being picked in a young green state.

Growers are chiefly interested in the cropping powers of any particular variety in their own district, and, where viners are used, in the capacity of the variety to ripen uniformly so that the maximum crop of peas at the correct state of maturity may be obtained.

Canners are also interested in the yield of peas from pods or vines, and the capacity of varieties to ripen uniformly, but in addition the variety chosen must be one which has the various desirable features mentioned above.

It has been found that the following varieties possess most of the qualities desired :—

Early Varieties	Alaska, Sharpe's First Early White, Sangster No. 1, Annonay, Chemin Long No. 4.
Main Crop Varieties ..	Lincoln, Gontier Blanc, Prince of Wales, Delicatesse, Yellow Admiral, Green Admiral, White Admiral.

Other varieties, tested during one season only, which gave very satisfactory results were :—

Advancer, Perfection, Surprise, Horsford's Market Garden, and Charles the First.

Details in regard to these varieties and several others that have been tested are set out below :—

EARLY VARIETIES—

Alaska .. This is an early variety which is used extensively for canning. It gives a very satisfactory, pale, even colour, but, like the majority of early varieties, the flavour is not so marked as in the main crop peas. The peas are small and round, but the small size of the pods is a disadvantage if the latter have to be picked and not vined.

Sangster No. 1, *Sharpe's First Early White* — These two varieties are very similar to the Alaska in size, appearance, and flavour.

Bountiful .. In the early experiments this variety was tested out thoroughly, and gave excellent results, but it has not yet been canned by the present colour method. It is an early pea which grows with larger pods than the varieties mentioned above. The flavour is good.

Annonay .. The shape and colour of this variety are not quite so good as Alaska and Sangster. Otherwise the quality is quite good when canned. The pods also are inclined to be small.

Chemin Long No. 4 — This pea has given a good yield, and has canned very well. The pods are small.

Advancer .. A variety that is grown fairly extensively in America. It gives a good, even, pale coloured product when canned. The pea is of medium size, with a good flavour.

MAIN CROP VARIETIES—

Lincoln .. The most popular variety of pea for canning in this country at the present time is the Lincoln. It is a variety that grows easily in many districts, and generally turns out to be very satisfactory when canned. Occasionally it shows a slight olive tint, and it may be found that certain other varieties such as Advancer, Perfection, Horsford's Market Garden, Prince of Wales, and the Admirals actually keep their colour rather better than Lincoln. The flavour is very good, and a satisfactory yield is generally obtained.

Gontier Blanc .. This is an early main-crop pea with rather small pods. In all the tests it has given a very good product as regards colour and flavour when canned. The peas are small.

Prince of Wales — Of the larger varieties this may be regarded as one of the best from the point of view of flavour and colour. The pods are fairly small, but the yield is generally good.

Delicatesse .. A medium-sized pea, with a very good flavour. In all the experiments this variety has canned very well, and has given an excellent product.

Yellow Admiral, *Green Admiral*, *White Admiral* — These varieties are canned in America. The colour and flavour are very good. In 1930, the peas belonging to these varieties were decidedly smaller than the ones grown in 1929.

Dwarf Canner .. A small pea that gave a good yield of peas from pods. The flavour and colour were both very good.

French Canner — This has only been tested during one season. Two lots gave peas of a rather poor colour, but two other lots turned out to be excellent.

Senator .. — A large pea of very good flavour and colour. The main disadvantage of this variety is the tendency of the peas to split during the blanching process. Except for this undesirable feature, the product obtained is very satisfactory.

Perfection .., *Horsford's Market Garden* .., *Surprise* .. — These three American canning varieties were tested out in 1929 and gave very satisfactory results. Surprise is an early pea of good flavour.

Charles the First — This is a useful variety with which to extend the canning season, as it generally crops later than the majority of the main crop peas. It was tested out only during the 1930 season, and gave very good results. The peas are fairly large, uniform, and of a good colour and flavour.

* * * * * *

VARIETIES OF PEAS FOR CANNING

J. C. WALLACE, M.C.,
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IN view of the possible development in the canning of peas, arrangements were made in the spring of 1930 to carry out trials of varieties of peas commonly grown on the Continent and in America for the purpose of canning. Several other likely varieties were also included.

On the Continent and in America, the small round varieties, of which there are many, are generally favoured for canning. In England, at present, Alaska and Lincoln appear to be the most favoured varieties for canning in the green stage; the Alaska is a small round pea, and the Lincoln rather a large pea, not quite of the type generally used for canning in other countries. As the Lincoln was a variety favoured by the local canning factory, it was decided that other varieties of similar type should be included in the trials.

Objects of the Trials.—The objects were :—

(*a*) To test varieties for their suitability for canning.
(*b*) To obtain information as to the date of maturity of the different varieties.
(*c*) To compare the cropping capacity of the varieties.

(*a*) On the Continent and in America, a number of varieties are grown for canning. It was desired to obtain information as to the behaviour of these varieties when grown in England. Seed was obtained from seed houses which handle large quantities of canning peas. Seed of

certain varieties grown in America was ordered from that country, but owing to a misunderstanding, did not arrive in time. Twenty-six varieties were sown, and also two stocks of four of the varieties.

The Director of the Fruit and Vegetable Preservation Research Station at Chipping Campden kindly offered to undertake the canning of the several varieties, and his report forms the subject of the preceding article in this issue of the JOURNAL. The essential requirements in a good canning pea are also given in that article.

(*b*) The season for the canning of peas is, even under the best of conditions, very short. If only two varieties are grown, the available time for canning becomes greatly reduced, more especially if the season be hot and dry. It was hoped to find amongst the varieties tested some that would lengthen the season at both ends. A longer season would reduce the overhead charges at the factory, and would enable the farmer to grow a larger acreage. Sowing later than usual may sometimes provide a later crop, and thus lengthen the season, but the method is uncertain.

(*c*) Varieties differ widely in their cropping capacity. Variation may even be found between different stocks of the same variety. This point, however, was not gone into in these trials.

No information was available regarding the behaviour of Continental and American varieties when grown in England. It was known that most of these varieties were of the small-podded type, and might not be suitable from the point of view of the grower. Small-podded peas are a disadvantage when the pods have to be picked by hand. It was found necessary on the farm at the Institute to pay the picker 3*d*. extra per 40 lb. bag when picking small-podded varieties, and even with the extra payment, very little more than the usual hourly wage was made. When peas are grown near to a factory that has a viner, or when a viner can be fixed up in the district, this disadvantage does not arise, as the haulm with the pods attached can be cut by a mowing machine, and carted direct to the viner or to the factory.

Method of arranging the Trials.—Four 50-ft. rows of each variety were grown in quadruplicate. One pint of seed was allowed to each row. This seed rate was higher than is usual, but as the trials were in the open field it was anticipated that

birds might be troublesome, and it was desired to have a full plant of all varieties. An excellent germination of all varieties was obtained, and some varieties, therefore, produced too thick a plant, which it was found impossible to thin out satisfactorily.

The spacing allowed between each variety was 6 in. more than its approximate height. The plants were not staked, but when about 6 to 8 in. high, a little soil was drawn on to one side of each row. This caused all the plants to grow in one direction, and intermingling of the varieties was avoided.

The seed was sown on April 17 and 18, 1930. One or two of the later varieties were attacked by thrips.

As each variety became ready, three rows were picked, in order to obtain weight records. A certain quantity was forwarded to Chipping Campden, and the remainder otherwise disposed of. One row of each variety was left to mature for seed.

Variety	*Date of pulling*	*Height*		*Seed*	*Average yield of pods :— lb. per 50 ft. row*
		ft.	*in.*		
Alaska S. ..	July 7	3	0	Bluish Green. Round ..	22
Alaska J. ..	,, 7	3	3	Bluish Green. Round ..	22
Sangster No. 1	,, 7	3	0	Whitish Yellow. Round	18½
First Early White	,, 7	3	0	Whitish Yellow. Round	20
Gontier Blanc	,, 11	1	9	Golden Yellow. Round ..	26⅔
Fenland Wonder	,, 11	2	0	Medium Green. Wrinkled	23
Kelvedon Wonder	,, 11	2	0	Medium Green. Wrinkled	27⅔
French Canner A.	,, 15	3	0	Green and Yellow. Round (mixed). ..	29
Thos. Laxton	,, 15	3	0	Greenish Yellow. Wrinkled	32
Chemin Long A.	,, 15	2	0	Whitish Yellow. Round..	31⅔
Chemin Long B.	,, 15	2	0	Whitish Yellow. Round..	34⅓
Annonay ..	,, 16	1	6	Whitish Yellow. Round..	33
Little Marvel	,, 16	1	3	Dull Green. Wrinkled ..	25⅔
Early Annonay	,, 16	1	6	Whitish Yellow. Round..	26⅔
Witham Wonder	,, 16	1	6	Green. Wrinkled ..	30⅓
Meteor ..	,, 16	2	0	Green. Round ..	32⅔
White Admiral	,, 18	3	6	Light Yellow. Wrinkled..	35
Yellow Admiral	,, 18	3	3	Light Yellow. Wrinkled..	37⅓
Green Admiral	,, 18	3	3	Light Green. Wrinkled ..	35⅔
Senator ..	,, 18	2	10	Whitish Green. Wrinkled	39⅓
Early Kenilworth	,, 18	3	0	Pale Green. Round ..	37
Mercury ..	,, 19	3	0	Greenish Yellow. Wrinkled	41
White Brunswick	,, 19	3	6	Medium Yellow. Round	43
French Canner B.	,, 19	3	0	Whitish Yellow. Round	33⅔
Prince of Wales	,, 23	2	9	Pale Yellow. Wrinkled ..	47⅔
Delicatesse ..	,, 23	2	0	Pale Green. Wrinkled ..	23⅔
Dwarf Canner	,, 23	1	3	Greenish Yellow. Round	23
Wm. the Conqueror	,, 23	3	0	Bluish Green. Round ..	37
Lincoln A. ..	,, 23	1	6	Yellowish Green. Wrinkled	27
Lincoln B. ..	,, 23	1	9	Green. Wrinkled ,,	29⅔

Notes on Yields.—The yields given in the table are the average of three rows. They may be taken as giving a general indication of the comparative cropping capacity of the variety. It would be misleading, however, to convert these figures to an acreage basis, as under ordinary field conditions the rows would be sown very much closer together, with a probable reduction in the yield per plant.

The following results obtained on half-acre plots, sown at a spacing of 1½ ft. between the rows, may be of interest when compared with the comparative yields of the small-scale trials.

Variety	*Yield per acre in 40-lb. bags*	*Yield in lb. per 50-ft. row in small-scale trials*
Prince of Wales ..	301	47⅔
Lincoln	238	29
Chemin Long ..	286	31⅓
Annonay	219	33
Sangster	227	18½
Alaska	207	22

The difficulty in working out on an average basis the yields obtained in the small-scale trials may be explained by comparing the yields of the variety Chemin Long. In the small-scale trials 2½ ft. were allowed between the rows of this variety and the adjoining rows. The average yield obtained was 31⅓ lb. per 50-ft. row. On an acreage basis this would give 272 bags per acre. If worked out on a spacing of 2 ft., and the same yield per 50-ft. row, the yield per acre would be 341 bags, and at a spacing of 1½ ft. 459 bags per acre. When grown on a half-acre scale, at 1½ ft. between the rows, the yield, as shown in the above table, was 286 bags per acre.

It is proposed to carry out spacing trials of selected varieties in 1931.

Suitable Varieties.—Of the varieties found by Mr. Hirst to be suitable for canning purposes, and recommended by him in his report, the heaviest cropper is Prince of Wales. In the trials this variety has yielded a heavier crop than Lincoln, although Lincoln is generally regarded as a heavy cropper. In the half-acre plots, the rows of Lincoln were somewhat too far apart, and chickweed became very troublesome. This, no doubt, somewhat reduced the yield. In the small scale trials, however, where conditions were of the best, Lincoln did not yield too well. Prince of Wales is suitable for hand-picking.

Of the early varieties, Sangster No. 1 produced a heavier crop than Alaska in the half-acre plots, but *vice versa* in the small-scale trials. Chemin Long is a heavy-cropping mid-

season variety. The White, Yellow and Green Admirals are apparently good croppers, as well as good canners, but have not yet been tested out in large-scale trials. All these varieties are small podded, and not suitable for hand-picking.

The name French Canner is too vague. The two stocks of this variety included in the trials were not the same pea, and Mr. Hirst reports that one was suitable and the other unsuitable for canning. The stock marked good produced a small seed, round and yellow in colour. The other stock produced a larger seed, slightly wrinkled, and yellow-green in colour. There was also a difference of four days in the date of maturity.

The variety Delicatesse, which is largely used in Germany, and of which Mr. Hirst gives an excellent report, did not produce a very heavy crop. Allowance should be made for a much too thick plant, and also an attack of thrips. This pea is short and sturdy, and would apparently require a thinner seeding. The pods did not fill out well.

Gontier Blanc produced rather small pods, many of them being badly misshapen. In view of the poor appearance of the pods, the yield is surprisingly good, especially when compared with a large handsome-podded variety like Fenland Wonder.

The pods of Dwarf Canner did not fill properly.

Conclusions and Recommendations.—Varieties suitable for canning and for the grower are suggested.

Early, midseason and late varieties should be chosen.

The present season for canning is too short, and suitable varieties that will ripen later are required. Late sowing of early varieties is not generally successful in the open field.

The date of pulling of a variety will vary according to district, but peas must be grown within reasonable distance of the factory on account of freightage and the necessity for canning when quite fresh.

The placing of viners in districts outlying from the factory would be of great advantage to the grower.

* * * * * *

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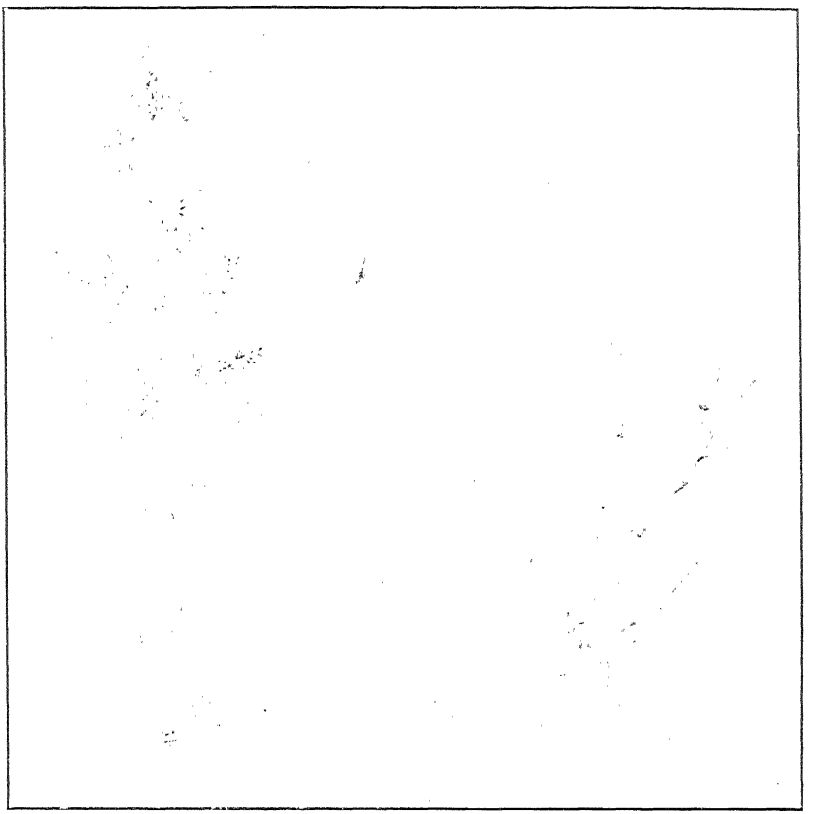


FIG. 1.—MARSH BENT GRASS (*Agrostis alba* L.).

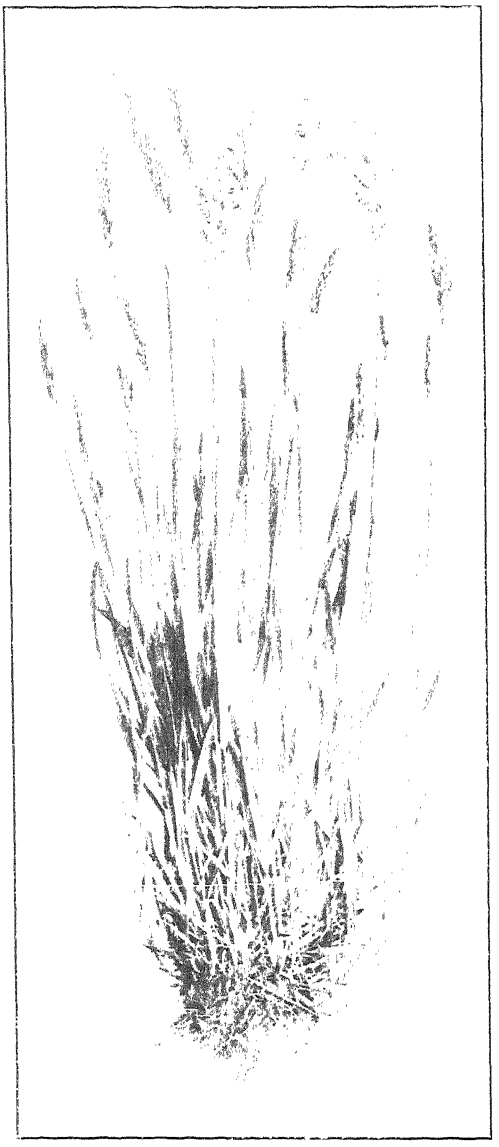


FIG. 2.—YORKSHIRE FOG (*Holcus lanatus* L.).

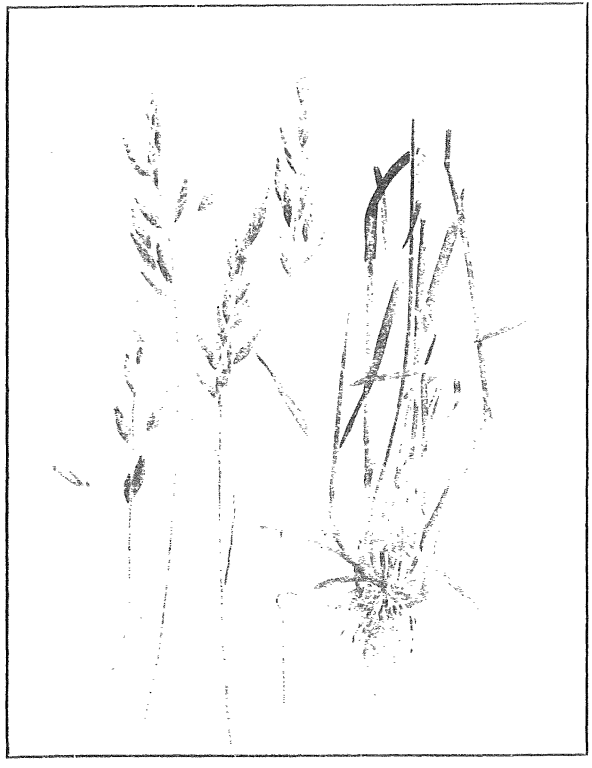


FIG. 3.—SOFT BROME GRASS (*Bromus mollis* L.).

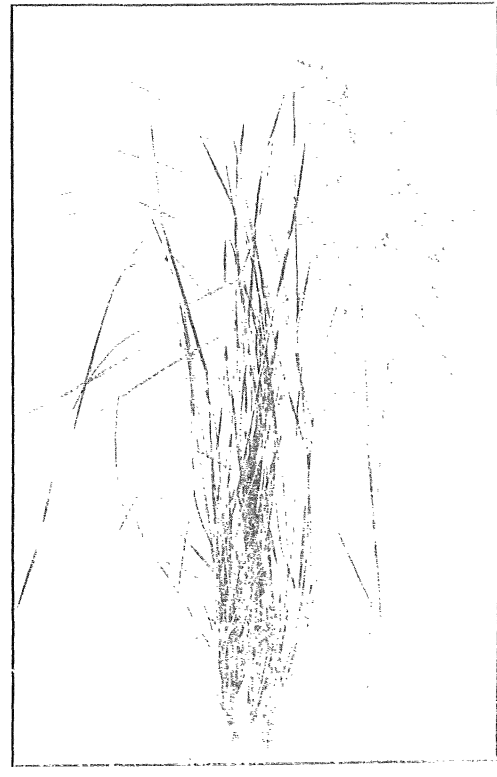


FIG. 5.—TUFTED HAIR GRASS (*Aira cæspitosa* L.).



FIG. 4.—STERILE OR BARREN BROME GRASS (*Bromus sterilis* L.).



FIG. 6.—FLOATING FOXTAIL (*Alopecurus geniculatus* L.).



FIG. 7.—MAT-WEED (*Nardus stricta* L.).



FIG. 8.—MEADOW BARLEY GRASS (*Hordeum pratense* L.).



Fig. 9.—Wall Barley Grass or Waybent (*Hordeum murinum* L.).

WEEDS OF GRASS LAND.—V.*

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AMONG weeds of grass land must be included an appreciable number of grasses. These species are worthless members of meadows and pastures, replacing better herbage, and are avoided by stock when richer or more succulent food is available. All such useless or harmful grasses should, where possible, be reduced, as they usually will be where efforts are made to improve pastures and meadows with the object of securing a maximum of good herbage. It is nevertheless to be borne in mind that certain of these poor grasses—such as Yorkshire fog and the bent grasses (*Agrostis*)—may prove of distinct value under certain conditions.

Bent Grasses (*Agrostis* spp.) are very often important species in the composition of the herbage of permanent pastures, and while their presence is unwelcome where something better can be encouraged, they may be valuable in some situations.

Marsh Bent-grass or Fiorin (*Agrostis alba* L.) is a very variable perennial. It occurs on most soils, and on both arable and grass land. In meadows and pastures it often replaces the better grasses. It is 1 to 2 ft. high, with or without stolons, and the stem is more or less prostrate below. The panicles (Fig. 1) flower from July to September, and vary considerably in size, being 2 to 8 in. long; the spikelets are very small, and when the seeds are ripe the branches of the panicle lie close to the main stem. The stoloniferous plant is often confounded with true "Couch," and, like *A. vulgaris* (below), is commonly included in the term "couch", "twitch", or "squitch."

The grass more generally known as Fiorin is Creeping Bent-grass, a variety of *A. alba* named *Agrostis stolonifera* L. This closely resembles *A. alba*, but has more pronounced stolons, rooting at the nodes of the procumbent stems and spreading rapidly. On moist soils, in wet meadows, and near rivers it quickly crowds out other grasses. This grass is sometimes recommended as a useful species in moist mountainous districts, especially on account of its late growth in autumn, but as it may crowd out other species, and it is difficult to obtain the seed pure, it should usually be avoided. It may sometimes be useful in a pasture, but is objectionable in the hay-field.

* The previous articles appeared in this JOURNAL in December, 1930 (p. 871), January, 1931 (p. 985), February, 1931 (p. 1107), and March, 1931 (p. 1192).

Fine Bent-grass or Black Couch (*Agrostis vulgaris* With.) closely resembles the species already described, but the branches of the seeding panicle are spreading. It is quite as useless as *A. alba.*

Brown Bent-grass (*Agrostis canina* L.) grows on wet peaty soils and heaths. It differs from the three grasses mentioned above in having an awn on the flowering glume.

In grass land the Bent-grasses are reduced by the application of lime, and by thorough and constant manuring, good management, and sound grazing. "Hoof cultivation" in winter, as by feeding roots, kale, etc., on the pasture, is regarded by some as one of the best means of reducing Bent-grasses. It is sometimes desirable to attend to the drainage, and mole draining is very useful.

Yorkshire Fog (*Holcus lanatus* L.) is one of the most common, most widely distributed and most conspicuous of grasses. Its varied coloration from the time the panicle pushes from the sheath until the seeds are dead ripe, all stages appearing at the same time, makes it very attractive. It occurs plentifully in meadows and pastures, water meadows and inferior hayfields on many soils, perhaps especially on calcareous loams. Yorkshire Fog (Fig. 2) is a densely tufted or very slightly creeping perennial, 1 to 2 ft. high, and covered with soft woolly down or velvety hairs. The slender stems are upright and leafy, the leaves flat and soft. The panicle is branched, 2 to 5 in. long, and in the early stages somewhat compact, opening widely when in full flower (June to July); the spikelets are much flattened and two-flowered, the upper flower being male and the lower bisexual. The awn on the upper flowering glume is not exserted from the spikelet. The colour of the panicles of Yorkshire Fog is very variable, many shades of green, pink, and purple being common, the whole blending so characteristically in infested pastures as to give rise to the name "Fog," such pastures being termed "Fogged" or "Foggy."

This weed grass is reproduced freely and rapidly from seed. The form of "seed" that occurs so commonly in rye-grasses is the flattened oval spikelet, consisting of two chaffy glumes and the contained kernel. The "husked seed" is fairly common in wild white clover, and is also an impurity of alsike and ordinary white clover.

Yorkshire Fog, like other hairy grasses, is generally refused by stock if other and more attractive herbage is available. In the young stage it is more leafy and less harsh, especially on damp land, and is then readily eaten by cattle, which thrive upon it. Indeed, the leaves often remain green in winter, and

on land that for some reason cannot be graded up, the grass is of some value for winter grazing. Some good pastures in Norfolk consist largely of this grass.

It is well to discourage and reduce Yorkshire Fog in favour of better grasses, or, if it be not present, prevent its introduction. This may be carried out: (1) by consistent liming and manuring, as it is less plentiful in rich pastures; (2) by preventing seeding, by running the mower over infested pastures with the knives set high to take off only the weed, which is generally well above the pasture grass in June; (3) by mowing grass for hay very early, before the seeds of the Yorkshire fog have ripened; and (4) by preventing the introduction of the "seeds" in grass mixtures for sowing, either for leys or permanent pasture.

Creeping Soft Grass (*Holcus mollis* L.) much resembles the previous species, but is much less common, being usually found in hedges, thickets, and shady places. On poor sandy soils, however, it is sometimes met with in the open pastures. In contrast with *H. lanatus*, which has tufted fibrous roots, the Creeping Soft Grass has an extensive creeping rootstock; it is not so hairy, except at the nodes of the stem; and the awn on the upper flowering glume is exserted from the spikelet. It may be reduced by the methods suggested against Yorkshire Fog.

Soft Brome Grass (*Bromus mollis* L.) is an annual or biennial weed, which is frequently very plentiful in meadows and leys, in water meadows, and by roadsides, but is not often found in old pastures. It has a tufted habit and slightly downy leaves. It is a handsome grass (Fig. 3), with spreading flower heads bearing a comparatively few large but beautiful lance-shaped downy spikelets, which contain five or more flowers, each flowering glume being awned. This grass flowers early, between May and June, and its seeds, by means of which it is propagated, are shed in the hay-field by June.

The awned boat-shaped seeds are very common in samples of rye-grasses, but can be distinguished from seeds of Italian rye-grass by the wider and more flattened top to the seed and the fact that the awn arises in a notch just below the apex of the seed.

Soft Brome Grass is useless to stock, and replaces better grasses. In meadows it may be reduced by manuring and by early mowing for two or three years to cut it before seeding takes place; and in pastures by consistent manuring with nitrogenous and mineral fertilizers.

Sterile or Barren Brome Grass (*Bromus sterilis* L.) is

common by roadsides, fences and hedges, in fields and waste places. It is an erect annual, about 2 ft. high, with narrow leaves, and very large open nodding panicles with drooping branches. The spikelets are at the end of long, slender pedicels, and are about 1 in. in length, slender awns adding perhaps another inch (Fig. 4). It flowers and seeds about June and July.

This weed grass may be reduced by the means applicable in the case of soft brome, as given above.

Wavy Hair-grass (*Aira flexuosa* L.) is an erect, slender perennial of about 1 to 2 ft. high, that often occurs abundantly on dry pastures and sandy heaths. It has short, narrow, curved leaves; the panicles of shiny brownish-green or purplish spikelets are 2 to 5 in. long; the branches are wavy or flexuous; and the flowering glumes are awned. Flowering takes place between June and August. The "seeds" were formerly used to adulterate those of golden oat-grass.

This grass can only be reduced by the adoption of measures to improve the pasture as a whole—liming, fertilizers, grazing.

Tufted Hair-grass (*Aira caespitosa* L.) is a perennial that occurs chiefly in damp pastures and meadows, and in woods. It is commonly known as Tussac, Tussock or Hassock grass, owing to the fact that it grows in dense close tufts which stand out as hummocks among the surrounding herbage. In some districts the tufts are named "bull faces" or "bull pates."[1] The grass (Fig. 5) grows from 2 to 4 ft. high, and has erect, stout, leafy stems, and flat rough leaves which "cut like razors." The nodding panicles bear flexuous branches of spikelets that resemble those of *A. flexuosa*, but have a shorter awn to the flowering glume. It flowers in June and July. This grass is seldom touched by cattle.

Tufted Hair-grass may be reduced by draining, liming, complete manuring and thorough grazing. The tufts should be dug up and left to wither or be made into a compost heap. More commonly the hassocks are chopped out with an adze.

Floating Foxtail (*Alopecurus geniculatus* L.) is a smooth perennial, flowering between May and August, 1 to 2 ft. in height, with a procumbent stem, which takes root at the nodes and thus covers the ground very rapidly (Fig. 6). The panicle is more slender than that of common Meadow Foxtail (*A. pratensis* L.), one of the best meadow and pasture grasses.

This species is occasionally troublesome on damp or wet meadows, and in ditches and ponds, growing so freely that shallow ponds may almost be filled up by it.

[1] *The Complete Grazier*, 14th edition, 1900, p. 924.

Draining will reduce this grass, and when it encroaches upon ponds it may be necessary to drain off the water and clear out the weed. After doing this it may be desirable to give a good dressing of salt, and if need be a second dressing, to make sure of killing out the weed before the pond is permitted to refill.

Quaking Grass (*Briza media* L.) is one of the best-known perennial grasses; it is frequently gathered for decorative purposes. Its loose spreading panicles of spikelets, variegated with purple and green, appear to be always moving or trembling —hence the names Quaking, Toddling, or Totter Grass. This grass has solitary, upright stems 1 to 1½ ft. high, creeping below. Flowering takes place in June.

Quaking Grass is a typical weed of poor pastures and meadows on light dry soils, and is a useless constituent of the herbage. Where it is abundant or even moderately plentiful, liming, manuring and even grazing will be likely to reduce it.

Mat-weed (*Nardus stricta* L.), also known as Mat-grass, is commonly found at high elevations—*e.g.*, 1,000 ft.—in poor, acid, peaty situations, especially where these are damp or actually wet. It is frequently associated with *Calluna*, *Agrostis*, *Aira flexuosa* and *Vaccinium*. This grass is a small perennial only a few inches high, with densely tufted slender leaves and creeping rootstock, and erect, wiry stem and solitary spikes, with all the spikelets on one side (Fig. 7). Flowering occurs in June and July. Mat-weed is common upon heaths and dry upland pastures, and on account of its hard, wiry character is refused by sheep. In the situations in which it occurs its reduction is difficult, since it is generally held that these poor uplands are not worth expenditure. In suitable instances, however, it may be considered whether some expenditure on lime and phosphates might be usefully incurred after cutting over the herbage, this being followed, if there was promise of improvement, by rather heavier stocking with sheep.

Meadow Barley Grass (*Hordeum pratense* Huds.) occurs in damp meadows and pastures, but is not often abundant. It is a perennial having slender stems 1 to 2 ft. high, and a general resemblance to a diminutive specimen of ordinary barley. The spikes are 1 to 3 in. long, nearly half an inch broad, and yellow-green in colour; the spikelets are rough and awned (Fig. 8). The rootstock is creeping.

In pastures meadow barley grass is sometimes considered useful so long as it is not allowed to flower, but the rough

spikes are unpleasant, and may be injurious to stock, so that the grass is objectionable in meadows.

Where it is plentiful, methods making for general improvement will tend to reduce it.

Wall Barley Grass, or Waybent (*Hordeum murinum* L.) is not generally troublesome, but it may be plentiful on dry soils by footpaths, roadsides, and waste places. It is an annual (Fig. 9), and much resembles *H. pratense*. Methods making for general improvement, together with cutting before seeding, will reduce it.

* * * * * *

A NEW METHOD OF PREVENTING ATTACKS OF BULB FLIES ON NARCISSUS

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THE culture of the narcissus in Great Britain on a commercial scale has expanded materially in recent years, so that the industry now involves a very large capital sum and employs a considerable quantity of labour. Of necessity a high proportion of the capital is invested actually in the bulbs themselves. Hence, any pest or disease damaging or destroying the bulbs is likely to inflict more severe financial loss than is the case with many other intensive or semi-intensive crops.

Unfortunately, enemies of the narcissus are both numerous and destructive, and the special nature and comparatively high value of the plants calls for a specialist study of the pests and diseases. Such a study has been in progress at the Seale-Hayne Agricultural College for the past seven years and, whilst many seasons must elapse before final pronouncements are possible, certain results have been obtained. The purpose of this article is to give a brief review of our present knowledge of the group of pests known collectively as Bulb Flies, and to bring some of the most recent applications of this knowledge to the notice of growers.

Species of Bulb Flies.—Second only in importance to the dreaded bulb eelworm, *Tylenchus dipsaci*, and indeed on some holdings in south-west England of primary importance, rank the bulb flies. The flies themselves are close relations of the common hover flies, which are familiar to everyone. Two species are responsible for the greater part of the damage, namely, the Large Narcissus Fly (*Merodon equestris*) and the

Lesser Bulb Fly (*Eumerus tuberculatus*). A third species, *Eumerus strigatus*, practically indistinguishable from the former, also attacks bulbs upon occasion. Strangely, it was this last species that was originally named the Lesser Bulb Fly, indicating that, unless it was wrongly identified, the species was at one time more common and has only recently been displaced by the now ubiquitous and nearly related *E. tuberculatus*. Larvæ of yet a fourth fly are sometimes found in very badly decayed bulbs. This fly is named *Syritta pipiens*, and whilst it is not difficult to distinguish it from the lesser bulb flies, when adult, the larvæ of both are very similar in appearance. Larvæ of this last fly are frequently sent in for identification, being often obtained in manure and refuse heaps, their presence giving rise to the fear that bulb flies are being introduced to the bulb gardens in manure. Experiments have shown that larvæ of this fly are unable to attack any but very badly rotted bulbs, and an account of the means of distinguishing them from the larvæ of *Eumerus* is in the course of preparation.

An excellent account of the life-histories of the flies attacking narcissus, together with up-to-date recommendations as to means of combating attacks, is to be found in the Ministry of Agriculture Leaflet No. 286. In addition a full account of the lesser bulb flies was published by the writer in 1927.* The Ministry's leaflet should be obtained by all interested persons, for the notes now to be presented are intended to supplement the information therein, and it will clearly serve no useful purpose to repeat the contents in detail here. Special emphasis must, however, be laid on the fact that a thorough working knowledge of the life-histories of the flies is essential before attempting control measures.

Life-histories.—Very briefly, the life-histories are as follows. Adult flies commence to appear in mid-May, and towards the end of the month the first eggs are laid. These eggs are placed either on the ground near a bulb, on the foliage, or, whenever the fly finds it possible, actually on the bulb itself. In a few days the eggs hatch, maggots emerge and immediately burrow into the bulbs. So far the account applies to both the Large and the Lesser Flies. After this stage a divergence in life-history occurs. The Large Narcissus Fly lays its eggs singly and

*Hodson, W. E. H., The Bionomics of the Lesser Bulb Flies, *Eumerus strigatus*, Flyn., and *E. tuberculatus*, Rond., in South-west England. Bulletin of Entomological Reseach, Vol. xvii, Pt. 4, June, 1927.

thus usually only one maggot enters each bulb. Egg-laying by this fly takes place between mid-May and the end of June. The maggots enter the bulbs in the vicinity of the base plate and remain inside until the following March, when they pupate and give rise to flies again in May. Thus there is but one generation in the year.

On the other hand, the Lesser Bulb Flies lay their eggs in batches, with a result that numbers of maggots enter individual bulbs and live gregariously. They, unlike the larvæ of the former species, feed rapidly, are fully grown in one month and, six weeks after the eggs are laid, emerge again as adult flies. This takes up to about the end of July, when there is a second generation of flies. The earliest of these appear to lay more eggs, which again produce adults during September. Those flies of the second generation which emerge during August, as many do, also lay eggs, but the maggots arising from these feed slowly, remain in the bulbs through the winter and give rise to flies again in the following May. Put still more briefly, the Large Fly has one generation and lays eggs from May till the end of June ; the Lesser Fly has two complete and a partial third generation, eggs being laid from mid-May until the beginning of September.

A perusal of the Ministry's leaflet already mentioned will indicate several very simple and effective means by which bulb fly attacks may be reduced. These methods, several of which are cultural and aim at preventing the flies from locating bulbs at the time of egg-laying, should be followed as a matter of routine. Very special attention should be paid to the matter of exposing bulbs after lifting. The second generation of flies is active at the lifting season, and all lifted, and particularly recently heat-treated, bulbs fall ready prey to their egg-laying activities if left in the open. Nothing more elaborate than an open shed is required to protect the bulbs from flies, for they never oviposit under cover, however primitive this may be.

Cultural Methods of Controlling Fly Attacks.—The cultural methods, such as raking beds, earthing up bulbs, cutting foliage, etc., and attention to general hygiene, as outlined in the Ministry's leaflet, have proved very effective as a means of materially reducing losses from bulb fly attacks. They should be, and in many cases are, practised by every commercial grower as a means of permanently reducing the fly population of the bulb fields. At the same time, whilst on paper and on an experimental scale they afford an almost complete control,

in the field certain factors must mitigate against their proving always completely effective under commercial conditions. The principal of these limiting factors may be conveniently summarized thus :—

(1) Uncertainty of the seasons. A warm spring may hasten the appearance of the flies, which will then commence egg-laying before cultural methods can be put into operation.

(2) Certain varieties of narcissus always seem very susceptible to attack. This is traceable to the foliage reaching a partially withered condition at a period of maximum egg-laying. Some varieties, notably White Lady, seem to fall an easy prey every year, while others only do so occasionally. By way of illustration, in the Penzance district a few years ago, Golden Spur was very severely attacked. In the following season it was almost entirely free, the attacks then being concentrated on Emperor and Victoria.

(3) Careless or indifferent growers are always to be found, and their bulb beds act each year as breeding grounds for hordes of flies, which eventually find their way to nearby gardens.

(4) Wild narcissi are abundant in some districts, while "escapes" flourish in the hedgerows and banks in others. These constantly maintain a population of bulb flies.

Fly Deterrents.—Having regard to all the above factors, it has been felt that some more direct method of dealing with the flies would be beneficial, more particularly for growers having stocks of unusual value, or gardens particularly liable to fly infestations. Preliminary experiments were made with various chemical substances for the purpose of keeping flies off the beds. It was hoped that it would be possible to mask the smell of narcissus, or alternatively to provide an odour disagreeable to the flies. In the first series of trials made at Newlyn, Cornwall, in 1926, paraffin-emulsion sprays were applied to the foliage. These kept flies away for not more than three days, and having regard to the length of the egg-laying period were clearly impracticable. Subsequently, dressings of crude naphthalene, on the surface of the bulb beds, using various quantities per acre, were carried out at Marazion, Gulval and other places in west Cornwall. These dressings acted well as temporary deterrents, but again appeared to be too transitory to be of general commercial use.

Poison Bait Sprays.—In 1926 and 1927, when bulb flies were being bred in numbers at the Seale-Hayne College, it was found that they fed freely upon a solution of sugar in water. White sugar proved to be the most satisfactory form to use, various brown sugars and crude molasses being definitely less attractive. Arising from these observations attempts were made to devise a bait which, while remaining attractive to the flies, would also poison them.

Sodium arsenite was found to answer the purpose well, but as the bait dried rapidly, it remained effective for only about two days. A further addition of quantities of crude glycerine was next made. This served to hold the bait on to any surface on which it was sprayed. More important, as it is deliquescent, it served the very useful purpose, unless conditions were exceptionally dry, of keeping the bait slightly moist for a considerable time by absorbing moisture from the air. The poison bait then arrived at was constituted as follows :—

4 oz. Sodium arsenite
1 lb. Glycerine (crude)
2 lb. Sugar (white)
4 gal. Water

This bait was used in the summer of 1929 in a number of field experiments in both Devon and Cornwall. It must be realized that accurate estimation of the effects of this type of spray is exceedingly difficult under field conditions. Even in cases of very severe fly infestations the recovery of many dead flies after spraying is most unlikely. It is not possible to leave control areas on the same group of gardens, as the flies travel considerable distances in the course of their egg-laying activities. All that can be done is to estimate the fly population, by means of counts on numbers of larvæ found at lifting time, and estimate whether or no they are below normal for the season and district. Observations of this nature made by both growers and County Council Horticultural officers suggested that very material reductions in the Bulb Fly populations had been made in the sprayed areas.

In the meantime further experiments were carried out with the spray in the insectary. Critical counts of the numbers of flies feeding upon the poisoned bait and upon an unpoisoned but otherwise similar bait were made. These showed that the arsenite did act as a slight deterrent. It was felt, on this score alone, that the use of some other poison might prove more effective, and it was also felt that some substance less dangerous than sodium arsenite, if equally effective, would be desirable. Various fluorides and silico-fluorides were tried out.

Most of these had a definitely deterrent effect upon the flies, but the addition of small quantities of sodium fluoride to the bait was apparently entirely unnoticed by the flies. A new bait was therefore made up early in 1930, constituted as follows :—

4 oz. Sodium fluoride
1 lb. Glycerine (crude)
2 lb. Sugar (white)
4 gal. Water.

The flies feed freely upon this material, and when it has been freshly applied, death takes place in from one to five hours after feeding. As the spray becomes staler so the flies are less quickly affected, and after exposure to the atmosphere for ten days the bait will take up to 48 hours before the full effects are felt. In the field the spray appears to remain effective upon the Lesser Bulb Fly for from 3 to 14 days and upon the Large Fly for from 3 to 10 days. The length depends entirely upon weather conditions experienced during the period. In the absence of heavy rains it would seem that it remains effective for some time, for, when sprayed on the inside of the insectary and glass windows, it has remained fatal to flies for almost three months. This spray has been used in various parts of Devon and Cornwall during the past season, with distinctly promising results. At one centre, numbers of dead *Merodon* were collected after spraying, while at most of the others very marked reductions in the numbers of flies on the wing were observed. As far as can be seen no killing of honey bees has occurred after spraying, but at the same time it would, perhaps, hardly be wise to spray in the immediate vicinity of hives.

Mode of Application.—It cannot be too strongly emphasized that unless this spray is applied at the right time and in the right place it will prove quite ineffective. The object is to produce a widespread distribution of the material in the form of large drops, wherever flies are prone to congregate, not a thorough soaking of bulb foliage throughout the plantation. Every grower knows that certain sunny and sheltered stretches of his gardens are those most frequented by the flies. These are the points at which the chief attack should be launched. The cost of the spray is approximately 6*d.* per gallon. Eight gallons should be used for each acre of ground to be dealt with, and a minimum of four sprayings made during the season—the first during the last week in May, the second in mid-June, the third in mid-July and the final one, which is aimed only at the Lesser Bulb Fly, during the third week in

August. It is most important that all four sprayings should be made at approximately the dates named, but it must be remembered that flies must be on the wing when the spray is applied. Therefore a bright, warm day should be waited for, and the operation should be carried out during the heat of the day, erring if anything on the early side. The collective cost of the materials for the four sprayings should not exceed 20*s.* per acre.

While the above may be expected to provide a satisfactory measure of control for the grower of ordinary commercial varieties of narcissus, the grower of valuable stocks, the hybridist and those whose gardens are seriously infested, would find that a slightly more liberal spraying, carried out at more frequent intervals, say, six sprayings instead of four, would be well worth the additional work and expenditure involved.

In conclusion, it must be stressed that the foregoing information concerning the use of a spray against bulb flies must be treated as a preliminary communication only. In view of existing evidence, the writer is confident that the destruction of adult flies by means of a poison bait spray is the most effective method of combating infestations. At the same time, it is freely admitted that further work in both laboratory and field may yet produce a more lasting and effective spray than either of the two described here.

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NUTRITIONAL VALUE OF RAW AND PASTEURIZED MILK

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THE troubles of the milk trade are due, in a general sense, to lack of knowledge, but it is not fair to blame any particular person for this. The successful production and distribution of milk must depend upon :—

1. Freedom of the milk from disease organisms.
2. The influence of various factors, especially bacteria, which determine the duration of sweetness.
3. The nutritional value of the milk.

Inquiry into these factors shows that the knowledge of the true causes of many diseases only started about fifty years ago ; and while, on the one hand, a very considerable amount of work has been done on the medical side, much less has been done on the veterinary side. It was only about twenty years back

that knowledge of all the factors which govern the keeping and carriage of milk was started upon a true basis, and the modern study of nutrition dates from about the same time.

It is not surprising, therefore, that we are still in doubt regarding many of the factors concerned with this work, among them the true nutritional value of the different types of milk. Some people consider that it makes no difference whether milk is heated or not; others instinctively believe that raw milk has properties which are impaired by heating, but they have been in difficulty for lack of adequately controlled experiments to prove the point at issue. It is important, consequently, that any evidence which is available should be considered carefully and critically, partly to ensure the most effective use of such a valuable food and partly to provide a reliable foundation for further studies and for any necessary legislation. For this reason, the conclusions drawn from one of the latest experiments bearing on these problems are here examined.

In the report on the Lanarkshire milk experiment,* a comparison is made between the growth of groups of children on pasteurized and raw milk.

The results show a decided advantage of the milk-fed over the control children. The authors of the report conclude that "In so far as the conditions of this investigation are concerned, the effects of raw and pasteurized milk on growth in weight and height are, so far as we can judge, equal."

A casual perusal of the results may suggest some justification for this conclusion, but an examination of Table 12 (which compares the differences resulting from raw and pasteurized milk) shows that the weights of five groups favoured the pasteurized milk and of nine groups favoured raw milk; while, with regard to height, two groups favoured pasteurized milk, one group was equal and eleven favoured raw milk. It would appear possible to conclude from these figures that raw milk probably possesses an advantage.

Presumably, the object of including such a large number of children in the experiment was to overcome non-controlled influences—such as differences in the natural rates of growth of children, home feeding, treatment, housing, etc., but, in the published results, the children are grouped according to sex and age, with the result that each group consists of relatively small numbers. Thus, the probable errors are increased and the chances of drawing conclusive evidence are diminished.

* Department of Health for Scotland: "Milk consumption and the growth of school children." Report on an investigation in Lanarkshire schools. By Gerald Leighton and Peter L. McKinlay. H.M. Stationery Office.

It is difficult to find any valid reason why the results should not be shown in larger groups, or even in one single group for the whole of the children, for Tables 6 and 7 show that the growth rates in both milk-fed groups are fairly constant for all ages and both sexes. In any case, children between the ages of five and twelve years, in a single district and in one type of school, form a fairly uniform group. In view of this, the results have been recalculated on the basis of larger groups of children when the following results are obtained :—

TABLE 6 (FROM LANARKSHIRE REPORT)
Average increase in weights (in ounces) in the three groups.
(The figures in brackets represent the number of children in each group—see Table I of original report.)

Age	Boys			Girls		
	Control	Raw milk	Pasteurized milk	Control	Raw milk	Pasteurized milk
5	11·64 (42)	14·88 (26)	15·65 (27)	7·00 (51)	14·50 (16)	6·62 (26)
6	13·75(672)	13·51(325)	9·96(359)	11·21(686)	10·61(332)	10·05(353)
7	11·17(733)	14·85(372)	15·55(334)	8·90(716)	11·22(335)	12·94(352)
8	11·38(850)	14·21(419)	15·21(369)	9·77(802)	13·40(414)	13·37(410)
9	9·53(803)	13·43(466)	11·83(402)	7·87(820)	13·81(408)	12·52(406)
10	7·10(749)	13·53(363)	10·39(338)	9·51(729)	15·08(373)	13·96(340)
11	6·14(471)	12·74(265)	11·05(259)	14·62(494)	24·92(261)	17·08(246)

TABLE 6
Re-calculated to increase the number of children in each group.
Average increase in weights (in ounces) in the three groups.

Age (years)	Boys			Girls			Boys and Girls		
	Control	Raw milk	Pas-teurized milk	Control	Raw milk	Pas-teurized milk	Control	Raw milk	Pas-teurized milk
5, 6 and 7 ..	12·38	14·25	12·77	9·92	11·00	11·32	11·15	12·67	12·04
8 and 9 ..	10·48	13·80	13·45	8·81	13·60	12·95	9·65	13·71	13·19
10 and 11 ..	6·73	13·20	10·68	10·77	19·13	18·17	8·75	16·18	14·39
Total of all ages ..	10·06	13·78	12·42	9·74	14·41	13·82	**9·90**	**14·09**	**13·13**

TABLE 7 (FROM LANARKSHIRE REPORT)
Average increase in heights (in inches) in the three groups.

Age	Boys			Girls		
	Control	Raw milk	Pasteurized milk	Control	Raw milk	Pasteurized milk
5	0·75	0·95	0·94	0·86	0·64	0·87
6	0·80	0·87	0·87	0·80	0·86	0·84
7	0·76	0·87	0·82	0·75	0·84	0·81
8	0·74	0·82	0·79	0·71	0·81	0·78
9	0·69	0·80	0·74	0·66	0·76	0·78
10	0·68	0·76	0·68	0·71	0·79	0·72
11	0·69	0·74	0·70	0·77	0·86	0·81

TABLE 7
Re-calculated to increase the numbers of children in each group.
Average increase in heights (in inches) in the three groups.

Age (years)	Boys			Girls			Boys and Girls		
	Control	Raw milk	Pasteurized milk	Control	Raw milk	Pasteurized milk	Control	Raw milk	Pasteurized milk
5, 6, & ..	0·778	0·873	0·849	0·777	0·845	0·827	0·778	0·859	0·838
8 & 9 ..	0·716	0·809	0·764	0·685	0·785	0·780	0·700	0·798	0·772
10 & 11 ..	0·684	0·752	0·689	0·734	0·819	0·758	0·709	0·785	0·723
Total of all ages ..	0·728	0·814	0·772	0·730	0·814	0·790	**0·729**	**0·811**	**0·781**

The effect of re-classifying the children in this manner brings out the obvious advantage of both milk-fed groups over the controls, and also provides a single figure comparing the relative advantages of raw and of pasteurized milk.

Table 12 of the report gives a direct comparison between raw and pasteurized milk, the probable errors indicating the significance of the results, and from this table the authors conclude that there is no substantial advantage of one type of milk over the other. Table 12 as published in the report is reproduced below and has also been re-calculated on the lines adopted for Tables 6 and 7.

TABLE 12 (FROM LANARKSHIRE REPORT)
Differences of changes of weight and height in raw and pasteurized milk-fed groups.*

Age	Weight		Height	
	Boys	Girls	Boys	Girls
5	$-0·77 \pm 3·19$	$7·88 \pm 4·02$	$0·01 \pm 0·075$	$-0·23 \pm 0·055$
6	$3·55 \pm 0·94$	$0·56 \pm 0·94$	$0·00 \pm 0·018$	$0·02 \pm 0·015$
7	$-0·70 \pm 1·08$	$-1·72 \pm 1·04$	$0·05 \pm 0·019$	$0·03 \pm 0·019$
8	$-1·00 \pm 1·00$	$0·03 \pm 1·00$	$0·03 \pm 0·018$	$0·03 \pm 0·017$
9	$1·60 \pm 0·98$	$1·29 \pm 1·12$	$0·06 \pm 0·017$	$-0·02 \pm 0·016$
10	$3·14 \pm 1·24$	$-3·88 \pm 1·28$	$0·08 \pm 0·019$	$0·07 \pm 0·018$
11	$1·69 \pm 1·44$	$7·84 \pm 1·68$	$0·04 \pm 0·021$	$0·05 \pm 0·026$

* A negative sign indicates a difference in favour of the pasteurized milk fed group.

The re-classification (see table, p. 64) appears to change an uncertain conclusion to a certain one. Thus, if the weight increase on raw and pasteurized milk in the six groups be compared, it is found that one shows a very small advantage in favour of pasteurized milk and the remaining five show advantages, varying from 0·36 to 2·51 oz., in favour of raw milk.

When all the children on one type of milk are grouped together, the advantage of raw milk for growth in weight

TABLE 12

Re-calculated to increase the numbers of children in each group.
Differences of changes in weight and height in raw and pasteurized milk fed groups.

Age	Weight			Height		
	Boys	Girls	Boys and Girls	Boys	Girls	Boys and Girls
5, 6 & 7	1·31±1·03	*−0·39±1·02	0·46±0·73	0·025±0·016	0·019±0·016	0·022±0·011
8 & 9	0·36±0·97	0·66±0·95	0·51±0·68	0·046±0·015	0·005±0·014	0·025±0·010
10 & 11	2·51±1·21	1·04±1·12	1·79±0·79	0·063±0·017	0·062±0·017	0·062±0·012
Total of all ages	1·30±0.60	0·42±0·59	**0·86±0·42**	0·044±0·009	0·026±0·009	**0·035±0·006**

NOTES: (1) *This negative sign indicates a difference in favour of pasteurized milk—in all other groups the difference is in favour of raw milk.

(2) Complete accuracy is not claimed for the probable errors noted in Table 12 (re-calculated). They are based on assumed standard deviations of the differences of 40 for weight and 0·60 for height, and calculated from these figures by the usual formula $\cdot 6745 \frac{\text{S.D.}}{\sqrt{\text{No. of variates.}}}$ This may not be a true interpretation of the original method of estimating the probable errors, but it is believed that the assumed values allow a margin of error to ensure that the final figures are too high rather than too low.

becomes 0.86 ± 0.42. The cautious statistician might say that this is not a significant result, but he would admit that the chances are about 5 to 1 that raw milk is better.

The relative increases in height are invariably in favour of the raw milk, and in many of the age and sex groups the advantage is significant. When all the children are grouped together, the advantage of raw milk becomes $0{\cdot}345 \pm 0{\cdot}006$, *i.e.*, the difference is nearly six times the probable error which is undoubtedly significant.

In the light of these figures, it seems impossible to conclude that raw and pasteurized milk are equal in their effect on growth in weight and height.

It may be argued with truth that the actual differences in growth are small, but it must be remembered that the experiment only lasted four months, and, if a significant advantage for raw milk can be demonstrated in this short period, it will be evident that considerable differences may be expected in populations in the course of years or of generations.

It is quite clear that more complete studies of the relative values of the different types of milk that are put on the market should be carried out in order that final conclusions concerning them may be reached.

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MARKETING NOTES

National Mark Eggs.—The output of National Mark eggs continues to show a satisfactory increase. During February, 1931, 16·5 million eggs were packed under the National Mark; this figure, compared with 11 millions in February, 1930, represents an increase of 50 per cent.

Prices have shown the usual seasonal fall, which has, however, been much more marked than a year ago. For example, the average of National Mark Egg Central official prices for "Standards" in February was 3*s.* 6*d.* per 120 less than the average for February, 1930. At the lower prices, National Mark eggs have been in good demand, and large buyers, including multiple-shop firms, have found it possible and worth while to obtain bulk consignments. The consumption of National Mark eggs in the large centres of population has been appreciably stimulated.

National Mark Egg Central is performing an important function in handling increasing supplies and has now assumed responsibility for the publication of its official price quotations, a service that was formerly undertaken by the Ministry. Following the decision of the directors, these prices are now being issued weekly instead of daily, the official London Egg Exchange prices for each Monday's trading being published in the Press on Tuesdays.

National Mark Dressed Poultry.—The following packers have recently been authorized to pack dressed poultry under the National Mark :—

County	*Address*	*Registered No.*
Dorset	Bladen Poultry Products, Bladen Poultry Farm, Puddletown, Dorchester	5
Gloucester	Messrs. Alexander & Angell, The Stancombe Poultry Farm, Near Stroud.	6
Kent	The Sussex Fattening Farm, Barham, Near Canterbury.	4
Somerset	Somerset Egg & Poultry Co., Ltd., Leycroft Road. Taunton.	243

It is estimated that the total annual output of the packers now operating in the scheme will exceed 250,000 birds.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during February, 1930, and February, 1931, and the number of sides graded and marked for the five weeks ended March 21, 1931, were as follows :—

			Number of sides
	LONDON		
Weekly average	February, 1930		1,237
,, ,,	,, 1931		1,918
Week ended	February 21, 1931		1,960
,, ,,	,, 28, 1931		1,849
,, ,,	March 7, 1931		2,104
,, ,,	,, 14, 1931		2,218
,, ,,	,, 21, 1931		1,970
	BIRKENHEAD*		
Weekly average	February, 1930		174
,, ,,	,, 1931		342
Week ended	February 21, 1931		288
,, ,,	,, 28, 1931		255
,, ,,	March 7, 1931		262
,, ,,	,, 14, 1931		140
,, ,,	,, 21, 1931		149
	SCOTLAND*		
Weekly average	February, 1930		1,949
,, ,,	,, 1931		2,352
Week ended	February 21, 1931		2,456
,, ,,	,, 28, 1931		2,293
,, ,,	March 7, 1931		2,503
,, ,,	,, 14, 1931		2,875
,, ,,	,, 21, 1931		2,652
	TOTAL LONDON SUPPLIES (All Sources)		
Weekly average	February, 1930		3,360
,, ,,	,, 1931		4,612
Week ended	February 21, 1931		4,704
,, ,,	,, 28, 1931		4,397
,, ,,	March 7, 1931		4,869
,, ,,	,, 14, 1931		5,233
,, ,,	,, 21, 1931		4,771
	BIRMINGHAM		
Weekly average	February, 1930		487
,, ,,	,, 1931		506
Week ended	February 21, 1931		500
,, ,,	,, 28, 1931		521
,, ,,	March 7, 1931		500
,, ,,	,, 14, 1931		481
,, ,,	,, 21, 1931		458
	LEEDS		
Weekly average	February, 1931		709
Week ended	February 21, 1931		720
,, ,,	,, 28, 1931		726
,, ,,	March 7, 1931		722
,, ,,	,, 14, 1931		768
,, ,,	,, 21, 1931		666

			Number of sides
	BRADFORD		
Weekly average	February, 1931		437
Week ended	February 21, 1931		482
" "	" 28, 1931		468
" "	March 7, 1931		472
" "	" 14, 1931		436
" "	" 21, 1931		502
	HALIFAX		
Weekly average	February, 1931		109
Week ended	February 21, 1931		106
" "	" 28, 1931		120
" "	March 7, 1931		118
" "	" 14, 1931		114
" "	" 21, 1931		118

During February, there was a reduced demand on the part of retailers in London for all classes of beef, and prices remained relatively low for the season of the year. Imported chilled beef showed a greater decline than the home-killed product. Supplies of National Mark beef remained steady, totalling 18,448 sides. It is clear that, except for the Jewish trade, the demand for heavy-weight sides is small. In the past few years, farmers have made considerable efforts to meet this situation by feeding for early maturity, but there is room for further improvement in this direction.

Increased supplies of cattle were sent by farmers to Islington Abattoir for sale on a grade and dead-weight basis under the Ministry's scheme. Full particulars of this system have now been published in the Ministry's Marketing Leaflet No. 27, which is reproduced on pages 68-70.

In Birmingham, the average weekly number of sides graded and marked in February was 506, a figure that has only once been exceeded. Of the sides received on the City Meat Market, the percentage marked was greater than in any other month since April, 1930, and there is every indication that the scheme is making headway.

The weekly average number of sides graded and marked in the Leeds, Bradford and Halifax area in February was 1,259 (432 "Select," 721 "Prime" and 106 "Good"). The high quality of the beef offered for grading is being maintained. The helpful attitude of the trade in this area has materially contributed to the satisfactory start that has been made; practically all the gradable sides on the wholesale markets are being graded and marked. Grading and marking were also carried out, during February, in 36 private slaughter-houses within the area.

* Sides consigned to London.

Sale of Gradable Cattle from Farm to Abattoir on a Grade and Dead-weight Basis.—The experimental scheme for the grading and marking of beef with the National Mark was started in London in October, 1929.* Early in 1930, the Ministry decided, as a further experiment, to encourage the consignment of fat cattle direct from farm to abattoir for sale by dead-weight on the basis of National Mark beef grades. This further experiment has so far been restricted to consignments to Islington Abattoir, London, and the procedure has been as follows :—

The farmer desiring to make a trial of this method of sale informs the Ministry's Chief Meat Grader (11 Central Markets, Smithfield, London, E.C. 1) of the number and general description of the animals he wishes to offer. The minimum number for any consignment is, in practice, one truck-load. The description should state whether the animals are bullocks or heifers, their approximate weights, and the date of proposed consignment.

On receipt of this information, the Ministry's graders obtain quotations for the cattle from a number of Smithfield wholesale carcass butchers. These quotations are based on the grade reached by the cattle—*i.e.*, "Select," "Prime" or "Good" —and on the dead-weight per 8 lb. stone (sinking the offal). The quotations, when obtained, are forwarded by the Ministry to the farmer, who then decides whether the prices quoted are sufficiently attractive for him to send the cattle. If he decides to send, he notifies the Chief Meat Grader, who arranges to have the animals met at Islington (Maiden Lane Goods Station) and their live-weight noted.

Animals consigned on the grade and dead-weight basis should be marked by the sender with "A" on the hip and three clips ≡ on the buttock, to distinguish them from other animals received at Islington. After slaughter, the sides are duly graded by the Ministry's grader and weighed in his presence, and a certificate stating the grade and dead-weight is signed by him and forwarded to the sender. The wholesale butcher pays the sender on the basis of this certificate and the price quoted to and accepted by the sender.

Under this system, the sender bears cost of carriage, but there have been no other deductions. The sender has also taken the risk of condemnation for disease of the whole or part of the

* Marketing Leaflet No. 13, explaining the principles of the Home Killed Beef Grading and Marking Scheme, can be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

carcasses, excluding offals. Under arrangements that have now been made with the wholesale carcass butchers and the National Farmers' Union Mutual Insurance Society, with the concurrence of the Live Stock and Wool Committee of the National Farmers' Union, all cattle (except cows) of gradable quality sent in under this scheme will be insured by the wholesale butcher against the risk of total or partial condemnation at a charge of 2*s.* per head, of which one-half will be recovered from the sender by a deduction at the rate of 1*s.* per head from his account. The sender is thus insured against the loss due to condemnation (but not for any loss or damage in transit) for all cattle of gradable quality forwarded under the above scheme. Cattle which, though healthy, are ungradable, *i.e.*, rejects, are not insured; sides of beef from such cattle sent in on the grade and dead-weight basis are sold on commission.

Advantages of the System.—While a proportion of the beef cattle produced in England and Wales is naturally required for local consumption and is sold either directly to local butchers or in local markets, there are many thousands of cattle which are surplus to local requirements and come to the larger centres of population. The scheme described above is a method which enables such cattle to be sent directly from farms to abattoirs where the National Mark Beef Scheme is in operation, without incurring intermediate selling charges. This is of great importance to wholesale butchers as well as to farmers.

Sale by dead-weight under this system has the following advantages :—

(*a*) Cattle are sent directly from the farm to the abattoir, thus avoiding deterioration through unnecessary journeys, waits in markets, repitching, etc.

(*b*) The best cattle feeders stand to gain, since the percentage of dead weight to live weight in well-fed cattle is much above the average. When purchasing at a market, or on the live weight system, buyers, in general, must depend upon the average yield of dead weight for each class of cattle, and this process of averaging is necessarily disadvantageous to a good feeder.

(*c*) There is no uncertainty as to the weight of the carcass which forms the basis of the transaction.

The dead-weight system of sale when associated with the National Mark beef grades has the further advantages that :—

(*a*) The certificate signed by the Ministry's grader provides an independent guarantee that the farmer is credited with the correct grade of quality as well as the actual dead weight of the cattle he has produced.

(*b*) Since the farmer receives quotations according to quality before his cattle leave the farm, he can form a close estimate as to whether the price quoted compares favourably with the local price.

The system is still in its infancy, but the results have been sufficiently encouraging to warrant its continuance. The continuance of this experiment was, in fact, one of the recommendations of the Inter-Departmental Committee on the Grading and Marking of Beef (Cmd. 3648, July, 1930). Wholesale carcass butchers are always prepared to give quotations, and farmers who have so far sent up well-finished cattle on this method of sale appear to have been satisfied with results. The extension of the system on any considerable scale would have an important effect in reducing intermediate selling charges and helping to avoid gluts on country livestock markets. The Ministry, therefore, trusts that an increasing number of farmers will give the scheme an extended trial. Inquiries for quotations for the sale of cattle on this basis should be addressed to the Chief Meat Grader, 11 Central Markets, Smithfield, London, E.C. 1. **It should, however, be understood that transactions under this system are effected directly between farmers and wholesale carcass butchers, and the Ministry has no financial responsibility in regard to the transactions, its functions being limited to the grading of the carcasses and the certification of weights.**

The foregoing particulars are given in the Ministry's Marketing Leaflet No. 27, of which copies can be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

The full terms of the policy in use under the insurance scheme referred to above are printed as an appendix to the leaflet.

National Mark Wheat Flour.—The demand among members of Women's Institutes for supplies of National Mark flour to enable them to enter for the cookery competition which is being organized by the National Federation of Women's Institutes in conjunction with the Ministry, has led to the receipt of a number of applications from grocers and bakers for enrolment as authorized re-packers of National Mark flour. The following firms have recently received certificates of authorization :—

W. Q. Adams, 212 Kettering Road, Northampton.
G. Austin & Co., 4, 5 and 6, Market Place, Derby.
Bassingthwaighte's Stores, West End Street, Norwich.
Howard Brown, Bramley, Hants.
W. J. Cremer & Sons, 15 Crescent Street, Sittingbourne, Kent.
G. Dickinson, Cark Mills, Cark-in-Cartmel, Lancs.
R. D. Edwards, Ltd., Whitchurch, Salop.
J. Emberson, 5 Dover Street, Folkestone.
C. Foat, The Homestead Stores, East Studdale, Dover.
F. Mitchell, 62 Chapel Road, Worthing.

Morris & Co. (Shrewsbury) Ltd., Welsh Bridge, Shrewsbury.
A. Robson, Empire Stores, West Street, Berwick-on-Tweed.
Frank Wright, Canwick Road, Lincoln.
R. T. E. Yapp, Village Bakery, Amesbury, Wilts.

All these firms can supply National Mark flour in retail bags ready packed under the National Mark. Several authorized millers have also made special arrangements to pack in small bags for this trade.

Standard Packages for Honey.—As a result of the Ministry's investigations of the methods of marketing honey in England and Wales, a new type of carton for packing honey sections, and an improved shape of glass jar for extracted honey, have been registered at the Patent Office in the name of the Minister of Agriculture and Fisheries.

Cartons and jars made to the new specifications will be on view in the Ministry's marketing demonstrations at a number of the leading agricultural shows throughout the country during the coming season. Applications for licences to manufacture and distribute cartons and jars of the new designs should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

It is hoped that the Ministry's Report on the Marketing of Honey in England and Wales (Economic Series No. 28) will be published towards the end of April.

Publicity for National Mark Produce.—A National Mark shopping week was held at Nottingham, March 21–28, the central feature being the display of National Mark products at Exchange Buildings, Cheapside, Nottingham, referred to below. Arrangements for the week included hoarding poster and press advertising; public meetings at the Albert Hall, Nottingham, at which National Mark films were shown and addresses given on the National Mark; a shop window display competition; and an essay writing competition for the senior schoolchildren of the city, 8,000 of whom were given short talks on the National Mark, illustrated by films, at the Albert Hall. The local arrangements for the week were carried out by a strong committee representative of the trading interests of the city, the local branch of the National Farmers' Union and other rural organizations, with the Lord Mayor as chairman, and the Sheriff of Nottingham, vice-chairman.

The continuous press advertising of National Mark beef in the Leeds, Bradford and Halifax area is being supplemented, as at Birmingham, by means of lectures to meetings of various women's organizations by trained women speakers. Reports received by the Ministry indicate that these lectures serve a

valuable purpose, and stimulate an intelligent interest not only in National Mark beef, but in National Mark products generally. In the country districts, they have their counterpart in the lectures on the National Mark given to Women's Institutes on behalf of the Ministry by women speakers on the panel of the Empire Marketing Board. These latter lectures, while of a general character, lay special emphasis on National Mark flour as being of considerable practical interest to women of the countryside.

Reference has previously been made in these Notes to the National Mark Flour Cookery Competition arranged under the joint auspices of the Ministry and the National Federation of Women's Institutes. Entries for this are now complete, and the following twenty-six county federations have arranged county competitions on the dates shown :—

Already held (8) :—

County	*Date*	*County*	*Date*
Montgomery	Jan. 19	Suffolk, East	March 3
Oxford	Feb. 7	Cheshire	,, 4
Isle of Wight	,, 27	Dorset	,, 18
Lancaster	,, 28	Kent, East	,, 23

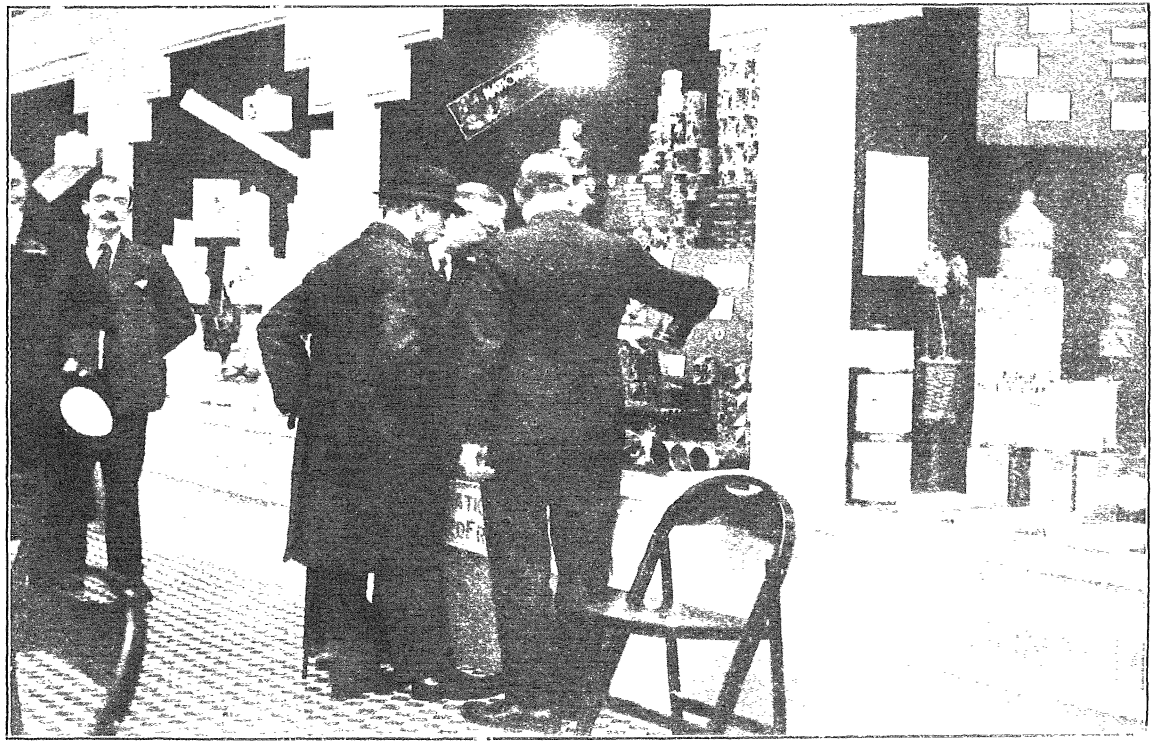
To be held (18) :—

County	*Date*	*County*	*Date*
Gloucester	April 10	Cambridge	May 13
Sussex, East	,, 16	Huntingdon	June 9
Cumberland	,, 17	Devon	,, 12
Sussex, West	,, 24	Cardigan	July 29
Cornwall	,, 23-25	Durham	Sept. 17
Shropshire	,, 28	Carmarthen	Not yet fixed
Essex	,, 30	Hampshire	
Monmouth	May 6-7	Isle of Ely	
Somerset	,, 7	Stafford	

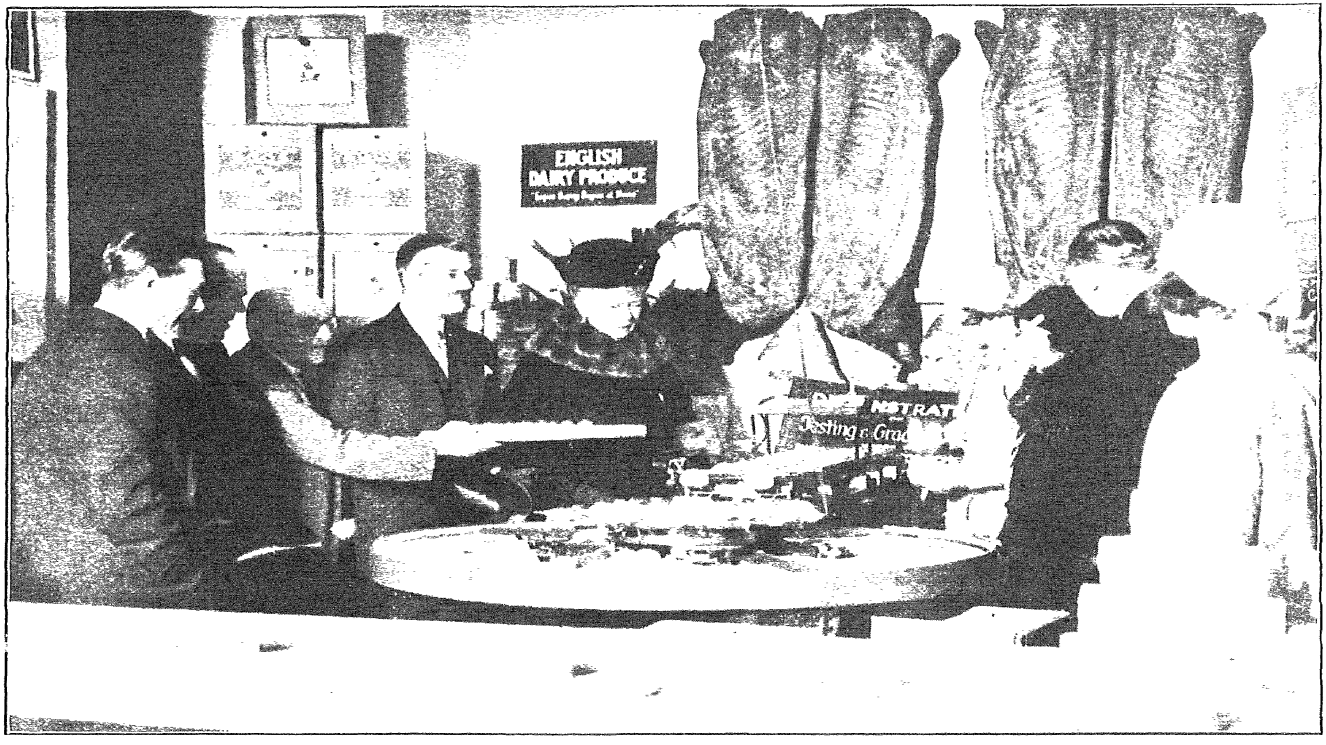
During March, a series of three advertisements of National Mark flour was inserted in certain newspapers circulating in Suffolk, Essex, Cambridgeshire, Isle of Ely, Hertfordshire, Bedfordshire and Buckinghamshire. A series of three advertisements of National Mark eggs, the third of which will appear early in April, was also arranged in certain of the more impo tant newspapers circulating in the large consuming centres of the country—Birmingham, Manchester, Leeds, Bradford, Sheffield, Newcastle-on-Tyne, Stoke-on-Trent, and Leicester. Advertisements of National Mark eggs and National Mark fruit were inserted in trade journals.

As part of the propaganda which is being conducted in Birmingham, on behalf of the National Mark scheme, a well-attended meeting of women was held at the Grand Theatre,

To face page 72.



H.R.H. The Duke of York inspecting the display of National Mark Produce at the Shire Horse Show, Agricultural Hall, Islington, on March 4, 1931.



H.M. The Queen and T.R.H. the Duke and Duchess of York and the Duke of Gloucester inspecting the Egg-grading demonstration on the England and Wales Stand at the British Industries Fair, Olympia, London, 1931.

Corporation Street, on March 6, at which the Chair was taken by Dame Ethel Shakespear, D.B.E., J.P., D.Sc., President of the National Council of Women in Birmingham. A display of films dealing with the National Mark scheme and the work of the Empire Marketing Board was given, and an address on the National Mark delivered by Miss Picton-Turbervill, M.P.

Displays of National Mark and other Home Produce.—A general display of home produce was arranged at the Exhibition of the Plymouth Grocers' and Bakers' Association, held in Plymouth, March 11–21. In connexion with the Nottingham National Mark Week, March 21–28, a display of National Mark produce was arranged in shop premises hired for the purpose in Exchange Buildings in that city.

The exhibit of National Mark produce at the Shire Horse Show, Agricultural Hall, Islington, February 24–26, was continued during the Thoroughbred and Hunter and Pony Shows, March 3–7. This exhibit is illustrated facing page 72. H.R.H. the Duke of York inspected this exhibit during his visit to the Hunter Show on March 4.

The photograph reproduced facing this page shows H.M. the Queen, T.R.H. The Duke and Duchess of York and the Duke of Gloucester inspecting the egg-grading demonstration on the England and Wales stand at the British Industries Fair, Olympia. The Royal party evinced great interest in the demonstration, which also aroused considerable interest alike amongst dealers, producers and the general public ; numerous inquiries regarding the National Mark egg scheme were received. The other section of the Home Country's stand, comprising a representative display of home-produced foodstuffs, was also well patronized. Over 5,000 samples of various commodities were sold.

Marketing Demonstrations—A list of Agricultural Shows to be visited by the Ministry in 1931 is given below. The main feature of the exhibit will be the National Mark Hall, which will demonstrate the scope and technique of the National Mark Schemes introduced to date. Demonstrations will also be given of the application of the National Mark to cheese and honey and of baking with National Mark flour. At the Bath and West Show, the manufacture of cider will be shown with special reference to the National Mark requirements, and at the Royal Lancashire Show a working demonstration of a National Mark egg-packing station will be given.

The list of Shows is :—

Name of Show	*Place*	*Period*
Bath and West	Bristol	May 20–23
Shropshire and West Midland	Shrewsbury	,, 27–28
Royal Counties	Portsmouth	June 3– 6
Three Counties	Hereford	,, 9–11
Royal Norfolk	Yarmouth	,, 17–18
Lincolnshire	Lincoln	,, 24–26
Peterborough	Peterborough	,, 30—July 2
Royal Agricultural Society of England	Warwick	July 7–11
Great Yorkshire	Huddersfield	,, 14–16
Royal Welsh	Llanelly	,, 22–24
Royal Lancashire	Liverpool	,, 30—Aug. 3.

The Canning Industry and Agriculture.—In the course of an address at a recent meeting of Ipswich Rotarians, Mr. W. W. Homan, of British Canners, Ltd., made some interesting remarks on the value of the canning industry to agriculture and the need for the organization of growers if the benefits of a continued expansion of the home canning industry are to be enjoyed.

After remarking on the need for the readjustment of agriculture in our economic system, Mr. Homan said that marketing presented the greatest problems and, at the same time, the greatest hope, to the agricultural industry. Perishability was the hardest of the conditions the farmer had to face, but, with the aid of industrial enterprise, a solution to this was at hand. Produce could be preserved until there was a market for it, and preserved in a form that lost none of its food value. Such were the possibilities with fruit and vegetables that were suitable for canning.

The whole object of the canning industry, Mr. Homan continued, was indissolubly linked to the interests of the growers. England had been behind in grasping this important factor. Canners could provide growers with a steady outlet and steady prices for the right produce, absorbing some of the surplus in times of glut. They could also increase the demand for the produce, so employing more men and machines. There was tremendous possibility in the export field. Methods of British canning had improved enormously, and in this direction Mr. Homan spoke of the improved double-lacquered containers now in use. Then there was the National Mark. Improvements were afoot to standardize containers. The British canners were ready to do business with growers who got together as a body, and were willing to sink their own personal identity by pooling

their output in an organized marketing scheme, and were thus able to accept long-period contracts for the supply of first-class fruit and vegetables. The days of individualistic competition were gone. Growers must form local combines large enough to handle important contracts of sufficient permanence to justify building a cannery for the purpose of dealing with the products of their orchards and fields. This meant nothing more than the acceptance of the general principle of co-operative effort, vital to the future of British agriculture.

German Agricultural Students' Tour in England.—A party of 28 lecturers and students from the Institute of Agricultural Marketing, Berlin University, under the leadership of the Director of the Institute, Dr. K. Brandt, arrived in England on March 1, for a week's visit, in order to study the marketing of agricultural products in this country.

The party visited the Ministry of Agriculture and Fisheries on March 2, when they were received by the Minister, who welcomed them to this country. The Minister said that he regarded their visit as a tribute to the value of the marketing work of the Ministry and as a sign of the big advance that this country was making in the region of agricultural marketing organization—an advance which would be carried an important stage further by the Agricultural Marketing Bill now before Parliament. Sir Charles Howell Thomas also addressed the party on the National Mark Scheme. The various aspects of the Ministry's marketing work were then explained in detail by the officials concerned.

Later in the day a visit was paid to the Empire Marketing Board. During their stay, the party visited representative markets in London and elsewhere, including Smithfield, Covent Garden, and Billingsgate, typical dairy, sheep, poultry and fruit farms, egg-packing stations, as well as a representative flour mill, bakery, and milk plant. The tour also included a journey to Oxford University and to Seale-Hayne Agricultural College.

Norway: Marketing of Milk.—By a Royal Resolution of January 30, 1931, the temporary law of June 6, 1930 (which provided for the setting up of a Marketing Council for bacon, milk, cheese and butter), was brought into immediate effect. The resolution also brought into force regulations imposing a compulsory levy of $1\frac{2}{0}$ Φre per kilogramme (= $\frac{1}{8}$d. per gallon) of cows' milk and goats' milk delivered by a producer to a dairy, cheese factory, milk condensing factory, or other business selling milk or milk products, the levy to operate

during a period of one year from March 1, 1931. The Marketing Council (which comprises nominees of the Society for the Welfare of Norway, the National Federation of Milk Producers, the Bacon Producers' Organization, the Federation of Commerce, the Peasants' League and the League of Peasants and Smallholders) was established in August last. This Council is empowered to collect the levies, by distraint if necessary, and to administer the money, which is owned in common by the organizations represented, for the promotion of the co-operative marketing of milk, butter and cheese. The milk levy is, by the regulations, payable by every milk producer, but the original law provided that the *receiving* firm—or, if necessary, the manager and board of the firm—would be held responsible for it.

Management of Co-operative Marketing Organizations.—The following address recently broadcast from the Washington (U.S.A.) radio station deals with a problem of considerable importance in connexion with co-operative marketing—the problem of efficient management. The address was given by Mr. Chris. L. Christensen, who, until recently, was the Secretary of the United States Federal Farm Board.

"Finding the right man to manage the business and the right type of men to serve as directors is a big task for farm co-operatives.

"Men are commanding a premium in the farmers' co-operative movement in the United States. There is a surplus of co-operative marketing plans and schemes, but a shortage of men qualified to carry them out. Men with managerial ability and experience are essential in developing and managing farmers' co-operatives.

"Articles of incorporation, by-laws, contracts, and highly developed organization and selling plans are worthless scraps of paper to the co-operative that does not have men well qualified to formulate the organization's policies and to manage its business.

"Farmers' co-operatives cannot succeed merely on compliance with the conditions of the Capper-Volstead Act and the Agricultural Marketing Act. Co-operative associations cannot be run by legal and legislative formulas alone.

"Farmers have a real source of help in the Federal Farm Board with its revolving fund. But it takes more than the Farm Board and a big revolving fund to build successful farm co-operatives; it takes men to direct and manage the affairs of the association if farmers are to realize the fullest benefits from the Agricultural Marketing Act.

"Wisely planned and intelligently directed management is by far the most important element in business success, and lack of it is the most frequent and certain cause of failure. The marketing of agricultural products is a business, and the farmers' co-operative association that undertakes the job must adhere to the fundamental principles of good business.

"The responsibility of management begins with the members of the association. It is the members who select the directors of the association. In performing this duty they should make certain that

they select as directors men who are qualified to outline the broad policies of the organization. Members of co-operative associations who complain about their directorate and manager too often have failed to exercise intelligently this first and most important duty.

"To the directors of a co-operative marketing association is delegated the responsibility of formulating policies and directing their execution. Too often there has been a tendency on the part of directors of co-operatives to shirk their responsibility. Too frequently the individual member elected to the board looks upon his selection as an honour conferred upon him in recognition of his standing in the community, and as carrying with it no responsibility. Such an attitude is unfortunate and, until every director comes to feel that he is accepting the trusteeship for the successful conduct of the business, co-operative marketing will not attain a full measure of success.

"Broadly speaking, the duties of the board of directors of a co-operative association are (1) to formulate policies; (2) to select a competent manager to carry out these policies; (3) to ensure that the policies are actually put into execution; and (4) to keep fully acquainted with the results secured.

"The formulation of policies is a most important part of the directors' job. Before a directorate can formulate sound policies it needs to seek facts upon which to base its conclusions. In becoming acquainted with the business, it is important that directors should consider only facts and that every vestige of prejudice and preconceived opinion should be cast aside. Directors cannot be guided by popular conceptions or by hearsay evidence.

"In the selection of a competent manager the board of directors is called upon to perform one of its most important and usually one of its most difficult tasks. The average board of directors of a farmers' co-operative has only a limited knowledge of the qualifications necessary for successful executive work.

"The manager must be a man of ability and experience to carry out policies consistently and to handle administrative matters efficiently. To obtain such a man, farmers must be willing to offer salaries comparable with those paid to executives in other businesses. The manager is responsible for carrying out the policies laid down by the board. He should also be regarded as an adviser to the board of directors. It should be a part of his job to present to the board thorough and complete statements, with clear interpretations as to the actual condition of the operations of the business. He should be ready with suggestions concerning new policies or changes in old ones, together with the reasons why changes should be made.

"Members of co-operatives are constantly being urged to display greater loyalty and co-operation toward their organizations. We all agree that this is essential. Co-operation, however, must work both ways. The directors and manager must also co-operate with the members. To make a wise selection of directors the members themselves must have an adequate grasp of the principles of co-operation and marketing and they should understand the policies of their own organization and be able to give the proper value to the results it may obtain. The manager and the directors should see that the members have the facts necessary to form sound judgments. Members should also know what their organization is doing. A well-informed membership is the foundation on which to build successful co-operation and the best assurance a directorate and a manager can have in conducting the affairs of the organization along sound business lines."

The Co-operative Marketing of Poultry Produce in Germany.—*The following article, by Friedrich Skaller of Berlin (Diplomlandwirt), has been translated from the German Agricultural Journal "Blätter für Landwirtschaftliche Marktforschung" for January,* 1931.

(*Editorial Note.*—In the last few years a widespread organization for the marketing of eggs through co-operative societies has been established in Germany with the assistance of the State. This organization has been successful in some directions and in others it has failed. The following article sets out the conditions under which the healthy establishment of an organization for the marketing of eggs and poultry by co-operative methods is possible, and is based on the experience gained by the author in developing the marketing of eggs on co-operative lines in the province of Hanover.)

(1) *The Position of Co-operation in Relation to the Marketing of Eggs.*—It cannot be denied that the *Reichsernährungsministerium* performed a public service in establishing the "German Fresh Egg" mark. By means of this mark, a standard of quality for an agricultural product was set up for the first time throughout the whole of Germany. For the attainment of this development the previous efforts of the German Council of Agriculture had supplied the necessary impetus. Whether the idea of stamping each individual egg was a happy one need not be considered here. The Eagle stamp is in existence to-day. What is now necessary is to establish an organization that will bring on to the market a sufficient quantity of eggs marked with the Eagle stamp which fulfil the conditions prescribed for the mark.

The chief drawback of the Scheme as at present in operation is that the number of eggs bearing the mark of standardization put on to the market by the German co-operative societies that are working on proper lines is far too small.

In most parts of Germany the organization of co-operative societies for the marketing of eggs is still in its infancy and must be allowed to develop slowly. The differences in the organization of the several co-operative societies show, however, that, in many cases, the successful establishment of such societies may be carried through at a much quicker rate than has been customary, and that the failure of particular societies is due to unsatisfactory organization and business methods. One of the best examples of an egg co-operative is that established at Osnabrück. This Society shows what can be accomplished when all parties concerned work energetically and with a full knowledge of the ultimate aim. The Osnabrück Society extends over a whole provincial area, and although it had only been established two years, it dealt with about 12,000,000 eggs in 1930.

If we are to determine what has led to the failure of some of the co-operative societies and what steps must be taken to place the organization of co-operative egg marketing on a healthy basis, we must first obtain a clear idea of the purpose of these societies and of the problems facing them.

Most farmers, and also a great proportion of the directors of the societies, consider their chief purpose to be the displacement of trading interests, because they believe that the existing traders are working on too great a margin of profit. They endeavour, therefore, to get rid of the distributor and to come into direct contact with the consumer. Almost all such attempts have failed. It is essential not to fall into the error of making the co-operative societies into small retail shops, for it must be clearly recognized that the activities of the co-operative

egg-packing stations should lie not in retail trade but in other directions. Their duty is to collect the eggs, to take note of the needs of the market and to deliver the produce in wholesale quantities to the wholesale trade, whose business it will then be to divide up these quantities as may be necessary and to cover the various stages until the consumer is reached.

If a co-operative society is to place on the market a standardized product of the best quality in large quantities in as regular a way as possible throughout the whole year, the society must not concern itself solely with dealing with the eggs that it has collected, but must get into direct contact with the producer, in order to influence him at the producing stage, with a view to his producing a quantity and quality that correspond to the needs of the market. This important duty can more readily be carried out by a co-operative society than by the distributive trade, which has only a casual connexion with the farmer and does not regard itself as the servant of agriculture, but is solely interested in its own profits.

(2) *Conditions underlying the Successful Development of Co-operative Egg-packing Stations.*—After making clear these fundamental facts, the special conditions that are of importance for the successful working of co-operative societies under modern conditions may be considered. In this connexion, it must be borne in mind that the opponents of the co-operative egg-packing stations include not only the traders who are threatened with competition but also, and to an important degree, the farming community who even to-day, for the most part, are standing aloof from the co-operative societies.

The farmers cannot be brought into the co-operative societies by economic lectures and promises only; the prices paid by the co-operative societies for eggs bought by them must, from the very beginning, be at least as high as those paid by traders. This result can be achieved in two ways :—

(1) *improvement of the prices* at which the co-operative societies sell; and

(2) *reduction in the cost of operation* of the co-operative societies so that each egg bears the least possible amount as its share of the expenses of handling.

As regards improvement of price, no important avenue remains unexplored, and the large stations obtain, on the whole, satisfactory prices. One mistake is, however, frequently made. Many co-operative societies send their eggs to a very limited number of large consuming markets without first arranging for the local demand to be met. The result is that in the smaller towns, the quantity of eggs offered for sale locally is too small, so that the prices in these small towns are higher than those in the large consuming centres. The demand is then met in these smaller markets by local buyers who, through a mistaken selling policy on the part of many of the co-operative packing stations, are able to pay the farmers higher prices than are paid by the co-operative societies. It follows, therefore, that *the local demand should first be met* and then the surplus eggs should be sent to the large markets.

Particular attention must be paid to the other condition, *i.e.*, the reduction of expenses. In this direction, considerable savings are possible with many co-operative societies. The variation of the expenses from ¾ *Pfennig* to 2 *Pfennigs* per egg shows what a wide field is available here. The expenses should, under normal circumstances, not be more than 1 *Pf.* per egg.

An important means of bringing about a reduction in costs is to increase the turnover of eggs, as it is clear that the share of expenses

per egg decreases within certain limits with increasing turnover. A co-operative society working according to the lines laid down for the "German Fresh Egg" must generally have a turnover in the year of at least 3,000,000 eggs in order to bring down the cost per egg to a reasonable figure. An increase in turnover can, in certain circumstances, be brought about more quickly if an endeavour is made to obtain the services of buyers, who have already an egg business in the locality, as collectors for the co-operative society. Generally, the buyers are quite willing to do this, as the risk involved in dealing in eggs is taken from them and they see their own turnover increased by the activities of the co-operative societies and the official egg distributing organizations. In spite of the smaller margin of profit per egg that they often obtain when they work in conjunction with the co-operative societies, this business is more profitable for them. Some examples known to the author show that by taking steps of this sort large and effective co-operative societies have been built up in a very short time.

Of great importance for the economic working of the co-operative societies is the fact that it is possible for them to smooth out, according to the means at their disposal, the seasonal variations in the quantity of eggs delivered—variations which are extraordinarily great.

In this task, it is an advantage to a co-operative society to have a number of owners of poultry farms as members, as they help to prevent too great a diminution in winter supplies. A change in production in agricultural undertakings in the direction of increased winter egg production is a matter of the greatest economic importance for the co-operatives. The cost borne by each egg dealt with through the co-operative societies decreases the more the societies are successful in making full use of their available staff and plant throughout the whole year in as even a manner as possible.

Favourable trade connexions for the disposal of eggs can be obtained only if the societies are in a position to offer eggs for sale not only in spring and summer, when the trade is overrun with offers, but also in the winter months when eggs are very much in demand.

In order to make better use of the organization of the egg co-operatives in seasons when egg production is at its lowest, various attempts have been made by these societies to deal with another seasonal product. For example, fruit has been handled and this can readily be adopted by the egg co-operatives as a seasonal sideline. It is, however, necessary that the special conditions obtaining in the locality admit of fruit being dealt with on a co-operative basis.

An essential condition for the successful running of an egg co-operative is a costing system dealing in the strictest possible way with the plant used and the wages paid. It is uneconomic for co-operative societies which, in favourable times have a daily turnover of only 10,000 eggs, to buy grading machines which can deal with 5,000 to 6,000 eggs hourly. The smaller the amount which each egg must carry as its share of the depreciation and of the capital cost of the plant used, so much the better. The same applies to wages. In the co-operative egg-packing stations, more use should be made than has hitherto been the case of payment by results or bonuses for work done. An exact knowledge of the details of the work is, however, necessary in order to fix properly the wages that should be paid on a piece-work basis.

The cost of actually handling the eggs, including overhead charges, should not be more than ½ *Pf.* per egg.

Special attention must also be paid to *costs of transport.* According to the experience of the author, the best practice has been to establish village collecting stations where the eggs are collected, and their weight

is determined, and where the money paid by the central packing station is distributed weekly. The expense of such a collecting station should not exceed ¼ *Pf.* per egg. From these local collecting stations, eggs are brought to the central packing station by means of a motor-lorry. The cost of transport from the collecting station to the central packing station by means of a motor-lorry owned by the organization can only be kept sufficiently low if it is possible to make daily use of a large motor-lorry the whole year through, loaded to its full capacity. The peak seasons of production can best be dealt with by making use of a trailer or by hired transport. It is necessary to arrange that the lorry during its tours—empty from the central packing station until it returns full—covers the least possible number of kilometres. The first and last collecting stations which are served by the lorry should lie as near the packing station as possible. The most advantageous use of such a lorry provides a means of fixing the most satisfactory size of the area that can be served by a packing station. This must be big enough for at least one lorry-load of eggs to be collected each week. With such an organization, the transport cost to the unloading stage of the packing station is kept within ¼ *Pf.* per egg. The geographical limits of the area served by the packing station should be determined solely on economic grounds.

In a province producing a surplus of eggs, as, for example, Hanover, the eggs should be dealt with in the packing stations in such a way that they can be sent direct to a favourable market in accordance with instructions received from the central organization. Unnecessary costs of transport which would arise if the eggs were, for example, in the first place sent to the central station in Hanover and from there re-distributed to other districts are thus avoided. The position is different in those central stations which are situated in a large consuming area, as, for example, Hamburg and Berlin. In these cases, it is economically sound to send all the eggs to the central stations and there to handle them.

A co-operative society set up on a strictly business foundation of this kind will be able to pay the farmer better prices for the eggs received than the trader, always assuming that the trader must grade and otherwise deal with the eggs before they are offered as fresh eggs, as he would under the legislation proposed. Better prices, such as can be obtained through the marketing in bulk of eggs of first-class quality at the smallest possible trading costs, constitute the best advertisement that a co-operative society can have, and are the surest means of inducing the farmer to send to it all the eggs he produces.

3. *Further Problems.*—A further means of linking the farmer more firmly with his co-operative society is the system of "*Help for the producer*," or "service" as the Americans call it. The most important assistance that can be given is advice with regard to modern methods of keeping poultry; the supply of cheap and good poultry food and suitable appliances, and the provision of pullets and day-old chicks of prolific breeds are also of great importance. Finally, the publication at regular intervals of a "News Letter" must be mentioned. By these means, a firm connexion between the farmer and the co-operative society will be established and, what is even more important from the economic point of view, the production of eggs both as regards quality and quantity will be improved. The farmer and the co-operative society will benefit equally from this. By means of the provision of suitable feeding-stuffs, production will be favourably influenced and, at the same time, the profits of this part of the business will cover a large part of the costs of organizing the system of "help for the producer." The provision of pullets and day-old chicks is also in various ways

advantageous, for by such means poultry keeping will be brought into line with modern methods. Breeds become less numerous, and those farmers who run poultry farms for stock-raising obtain an outlet for their produce in return for which they willingly become members of the co-operative egg-packing stations and deliver winter eggs to the societies. The limitation of the number of breeds is absolutely necessary for the successful marketing of poultry on co-operative lines. In this connexion one wheel interlocks with the other. That a service for helping the producer can be carried on by a large egg-selling co-operative society is proved by the fact that co-operative societies and poultry concerns in the United States of America have built up services of this kind in the last few years with marked success.

A last link in this chain of activities is the marketing of poultry. A necessary preliminary in the work of improving the marketing of poultry is the establishment of large active co-operative societies and the distribution throughout the country of fewer, but good, breeds of poultry. The successful marketing of poultry can only be carried out in conjunction with modern cooking and freezing apparatus and is dependent on the existence of established breeds which lend themselves to the production of standardized produce. Attempts to induce farmers to kill and dress their own poultry with a view to the co-operative societies collecting and marketing it would prove disappointing. The marketing of poultry on co-operative lines can only be carried out with success when live birds are sent to the co-operative society, where, by means of a special feeding installation, an 8–14 days' final conditioning with the aid of dairy by-products can be given. The poultry are then sorted, killed, dressed, cooled, graded, packed, and possibly frozen by experienced staff. In such an organization, the feathers can also be made use of and provide a secondary income which is not to be despised, besides assisting to reduce the 50,000,000 marks which are yearly paid for feathers imported from abroad, or possibly even keeping the whole of this sum in Germany.

In recent times, many efforts have been made by producers to bring frozen meat into discredit in the public eye. This propaganda is very dangerous because it can also be used against home-produced poultry. The successful marketing of poultry is not possible without the use of freezing methods, as it aims at smoothing out the gluts and scarcities of seasonal production. The technical processes are to-day so highly developed that the quality is scarcely affected by the freezing process.

Side by side with freezing, the canning of poultry will be of importance in the future. In the United States of America, a by no means negligible industry has already developed, but in Germany it is only in its infancy. Very promising researches have been made which are encouraging for further work in this field.

Developed and organized on modern lines, the marketing of dressed poultry would become a very valuable help to the co-operative egg-packing stations. It should influence many farmers, and particularly many poultry farmers, to become members of the co-operative societies, since the marketing of poultry to-day is in a very backward condition.

German co-operative societies can only become big and strong through success in the commercial world. They must avoid creating enemies unnecessarily. Work done hand-in-hand with the trade, so far as the actual selling to the consumer is concerned, will assist the business of marketing eggs on co-operative lines more than will the competition of existing traders.

NOTES ON SUPPLIES AND PRICES

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THE prices of most agricultural products continue to decline, though in a number of cases the change shown in the first week in March is small when compared with a month earlier. Nevertheless, the movement is in the wrong direction, and tends to bring prices still further below those of a year ago. Wheat towards the end of February temporarily showed a firmer tendency, but subsequently relapsed, so that there was little change. Both English mutton and pork were distinctly cheaper, as were eggs, but in the latter case the fall was seasonal. Store stock showed little change.

In the following table the wholesale prices ruling in the first week in March, 1931, are compared with those of a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets. Some imported produce is included for comparison.

	Prices in first week of		
	March, 1931	*Feb.*, 1931	*March*, 1930
	s. d.	s. d.	s. d.
Wheat, *Gazette* average, per cwt.	5 2	5 5	8 4
Fat cattle, per cwt.	48 0	48 7	54 7
Beef, English, N.M. Prime, per lb.	0 7½	0 7¾	0 8¾
Beef, Argentine Chilled, H.Q...	0 6¼	0 6⅛	0 7¼
Fat Sheep, first quality, per lb.	0 12¼	0 12⅜	0 14½
Mutton, English, per lb. ..	0 10¼	0 11⅜	0 12
Lamb, New Zealand, per lb. ..	0 7½	0 8¾	0 10⅜
Fat pigs, baconers, per score ..	13 9	14 1	20 10
Bacon, Danish green, per cwt.	67 0	66 0	118 0
Fat pigs, porkers, per score ..	16 11	17 5	23 0
Pork, English, per lb. ..	0 10½	0 12	0 14¾
Cheese, English Dairy Cheddar, cwt.	102 0	94 0	116 0
Cheese, New Zealand, per cwt.	62 0	59 0	90 6
Eggs, N.M. Standard, per 120..	13 3	16 6	14 6
Potatoes, King Edward, per ton	150 0	150 0	80 0
Wool, Southdown, per lb. at Bradford	0 12½	0 12½	0 18

As compared with a year ago, all the commodities in the above table show distinct falls, with the exception of potatoes. At the beginning of March these stood at £7 10*s.* 0*d.* per ton, a rise of £3 10*s.* 0*d.* above the same period last year, when the price was very low in consequence of the heavy crop of 1929. In the case of wheat, the fall is about 38 per cent.; cattle and beef are 12 and 14 per cent. lower, sheep and mutton about 15 per cent., bacon pigs 34 per cent., Danish bacon

43 per cent., pork pigs and pork 26 and 29 per cent., and wool 30 per cent. down—all as against March, 1930. Barley and oats show much less variation, the *Gazette* average for oats being about 5 per cent. lower, and for barley 5 per cent. higher than last year.

Wheat.—Sales of wheat on the home markets have been exceptionally light this season, the quantities returned as sold being less than one-half those of last year. To some extent, the smaller offerings are due to the reduced crop, but farmers naturally have been disinclined to sell at the low prices ruling during the past six months, and where possible are holding for better conditions. Unfortunately the position of wheat in the world's markets is entirely abnormal, and though prices have been a shade firmer just recently, it cannot be said that present indications suggest any definite improvement. The exportable surpluses available in the exporting countries are collectively about 50 per cent. in excess of the probable requirements of importing countries during the current season up to July next, and the problem of the future price of wheat depends primarily on the factors that tend to reduce or enlarge this unwieldy supply. These are, on the one hand, changes in the demand of importing countries or in internal consumption, and, on the other, the probable yield of crops at the next harvest; if an under-average harvest appears likely, there would be a better prospect of the large carry-over being absorbed next season, and this would lead to a revival in prices.

Both the United States and Canada started the season with a heavy carry-over from previous years, and are the two countries which are chiefly affected by excessive stocks. In the United States, the Federal Farm Board has been making efforts, in the interests of American farmers, to mitigate the disastrous fall in prices by buying wheat and holding it in store. This practice was begun last year, and on June 30, 1930, the Board held about 60 million bushels in hand on an understanding that this supply would not be marketed in competition with the 1930 crop. Subsequently, in November, when a further fall was threatened, the Board through its subsidiary, the Grain Stabilization Corporation, again entered the market "in order to stop panicky selling and to prevent further unwarranted declines in domestic prices." No authoritative statement of procedure has been made, but by continued buying the Board appears to have "pegged" the price of wheat in Chicago at about 80 cents per bushel (a figure at which it still stands), and the Board recently stated that

"since November the United States grower has been receiving from 20 to 25 cents per bushel more than the world price" (say 10*d.* or 1*s.* a bushel). The difference in the internal price can be seen by comparing the Chicago May future (on March 10) at 82¾ cents (say, 3*s.* 5*d.*) per bushel with the corresponding Liverpool future, which is equal to about 2*s.* 6¼*d.* per bushel, or with Winnipeg future at 58⅞ cents (about 2*s.* 5*d.*) per bushel. Moreover, as the Board is not operating on the next crop, the Chicago July future is only 62¼ cents (about 2*s.* 6¾*d.*) per bushel, which may be taken as approximately the figure at which current prices would stand if it were not for the operations of the Farm Board.

The Board is now very strongly urging farmers to reduce their wheat acreage, the idea being that if the United States production were reduced sufficiently to meet domestic requirements only, the American farmer would be sheltered by the tariff wall and would obtain much higher prices. "It is the conviction of the Federal Farm Board," said one of the members recently, "that the farmer in the United States cannot afford to grow wheat for export." The propaganda in favour of a reduction of area was probably started too late for it to have much effect on the winter wheat area for the 1931 crop, which only showed a reduction of about half a million acres, or 1·1 per cent., and it remains to be seen what reduction will be shown when the spring wheat acreage has been ascertained. No statement has been made as to what action will be taken (if any) in regard to the next crop, but the stock that will be held by the Board at the close of the season has been officially estimated at 120 million bushels, while unofficial estimates put it at 200 million bushels. The operations of the Board are of importance in two ways: (1) the liquidation of its existing stocks will have an appreciable effect on world prices, according to whether they are pressed on the market or held over a long period; and (2) if its policy of reducing acreage is adopted, it will help to adjust world supplies to requirements. In this connexion it may be noted that so far as the operations of the Board have tended to reduce exports from the United States, they have relieved pressure, and to that extent must have helped, temporarily at any rate, to maintain prices.

Another factor of importance in connexion with the United States is the extent to which supplies have been reduced by the use of wheat for feeding to live stock. Earlier in the season it seemed probable that with the prevailing low prices

large quantities would be absorbed in this way. The higher prices subsequently offered must, however, have tended to encourage sales, and it is doubtful if there has been much increased internal consumption. The stocks on farms on March 1 were estimated at 160 million bushels, against 129 million bushels at the same date last year, and the visible supplies in elevators, etc., were also larger.

Canada is in a similar position to the United States in having a very large carry-over from previous crops, and an exportable surplus (officially estimated on January 31 as 244 million bushels) much in excess of any probable demand. Prices reached an abnormally low level in December* (52⅜ cents, or about 2*s.* 2*d.* per bushel, at Winnipeg), but subsequently recovered, and early in March were fluctuating in the neighbourhood of 60 cents or 2*s.* 6*d.* per bushel. Exports up to the end of January were liberal, and much in excess of last year (157 million bushels against 97 million bushels), but the carry-over at the end of the season will probably be about the same, providing the rate of export continues for the remainder of the year. The main area of wheat is sown in the spring, and a reduction is probable.

In Argentina, the crop has suffered from rain and other damage, but the February forecast puts the yield at 29,900,000 qr., and the exportable surplus at 18,372,000 qr. Shipments up to January were on a small scale, but with the new crop are now becoming considerable.

Australia has a large crop of about 25 million qr., which is probably a record, and shipments from the Commonwealth are likely to be stimulated, not merely by the liberal surplus, but by the exchange rate which definitely favours export. It is reported also that the Federal Government has authorized the payment of a bonus of 6*d.* per bushel on wheat exports, but this does not yet seem to have been sanctioned by Parliament.

The position in Russia is less clear than in the other exporting countries, but production in 1930 was estimated at 1,157 million bushels as compared with 703 million bushels in 1929, and the area to be sown in 1931 is reported to be 19 per cent. greater than in 1930. Export has declined with the winter season, but may revive later on.

Milling restrictions and other devices intended to favour the price of home-grown wheat are in force in many Continental countries and tend to restrict imports. The poorer crops harvested last year have, however, created larger demands,

* 52⅜ on December 20, 1930, for December future; lowest, 50⅛ on December 26.

and shipments to Europe up to March 9 had materially increased at 44,436,000 qr. as against 35,161,000 qr. in the previous corresponding period. Supplies of native wheat are becoming exhausted in France, Germany and Italy, and increased purchases are likely in the next few months.

The factors that normally affect wheat prices at this season of the year are the reports of sowings for the next harvest. These begin to come to hand in April, and evidence of substantial reductions of acreage would certainly exercise a favourable influence on prices, as would also any extra buying by importing countries above what has been allowed for in trade estimates. Against any possible reductions in acreage must be placed, however, the strong probability of an increase in Russia, while other factors this year are the action of the Federal Farm Board and the size of further exports by Russia from last season's crop.

Sheep, Mutton and Lamb.—The number of sheep brought to market recently has been quite moderate for the time of year, but prices have moved definitely downwards. First quality Downs and Crossbreds, which in December and January had been realizing about 13¼*d.* per lb. dressed carcass weight, gradually declined to 12¼*d.* per lb. early in March, a rate that compares with 14½*d.* at the same period last year. This drop of 2¼*d.* per lb. is disappointing, because spring prices up to April-May are usually the best of the year. It appears to be due to the heavy arrivals of imported mutton and lamb in January and February, following on substantial receipts in the two preceding months. Thus, the total imports of frozen lamb in the first two months of the year amounted to 2,929,000 carcasses against 1,829,000 in the same period of 1930, while mutton carcasses rose from 513,000 to 602,000. The sources of supply were as follows :—

	Number of lamb carcasses received in January and February	
	1931	1930
From Australia	752,800	425,600
From New Zealand	883,500	690,100
From South America	1,292,400	713,300
	2,928,700	1,829,000

While all three countries contributed to this increase, the addition from South America was very noticeable. Reports of shipments suggest that receipts will continue for the present on a substantial scale, the quantity of lamb afloat on March 9

and due to arrive in March or April being 1,834,700 carcasses as compared with 1,419,300 carcasses a month earlier. The quantity afloat from New Zealand was particularly heavy at 1,403,000 carcasses, but the shipments from South America were only moderate. The total stocks in store and loaded on steamer in New Zealand at the end of February were also larger than at the same date in the previous year, *viz.*, 1,937,000 carcasses against 1,359,000, but the New Zealand Meat Producers' Board reported that killings were likely to be less in March, 1931, than in March, 1930. Although the number of carcasses that are being exported is thus much larger, the average weight per carcass is lower at 32·41 lb. as against 34·23 lb., a reduction of 5·3 per cent. in weight of meat, which is equal to over 400,000 carcasses. These heavy supplies had a very depressing effect on prices, best New Zealand lamb in London falling from about 8½*d.* per lb. at the beginning of January to 6¾*d.* in the first week of March, while Australian lamb fell from 7⅞*d.* to 5*d.* and Argentine from 7¾*d.* to 5*d.*

The trade in frozen lamb has been developing for some time past, and in 1930 noticeable progress was shown, chiefly in increased deliveries from New Zealand, though proportionately the rise was even greater from Australia. The shipments to the United Kingdom during the past three years have been as follows :—

	Number of lamb carcasses		
	1930	1929	1928
Australia	2,217,200	1,500,400	1,253,500
New Zealand	7,142,500	5,769,700	5,828,400
South America	4,946,300	4,333,200	3,430,700
Total	14,306,000	11,603,300	10,512,600

The number of mutton carcasses both from Australia and New Zealand also increased in 1930. Recent Census returns of the flocks in all three countries show figures larger than at any previous date, and the development of the trade may to some extent be due to a desire to reduce their numbers owing to the low prices obtainable for wool. On the whole, indications point to continued heavy shipments of frozen lamb for the next month or two. It may be mentioned that four freezing establishments in New Zealand were partially demolished in the recent earthquake.

Wool.—The average price realized for English wool at last year's wool sales was about 18 per cent. below pre-war prices. Subsequently values further declined and Southdown at

Bradford in February was realizing only 12½*d.* per lb., or 5½*d.* less than in the previous year. Early in March a more optimistic tone prevailed, and prices for merino wools at the Colonial sales and at the second series of London sales were distinctly better. Opening values at the latter were reported to show a rise of from 15 to 20 per cent. for both merinos and crossbreds.

The severe slump that has occurred in wool prices seems to be due primarily to the record clip obtained in 1928 in the principal exporting countries (Australia, New Zealand, Argentine, Uruguay and South Africa), combined with a general decline in consumption. In 1929 the yield, according to the U.S. Department of Agriculture, was only about 2 per cent. less. and in 1930, while Australia and New Zealand show reduced production, this was counterbalanced by increases in Argentina, Uruguay and South Africa, so that the 1930 clip from these five countries (which between them account for nearly three-fifths of the world's wool production) was practically the same as that of 1929. It is evident that the available supply is large, and any material improvement in price is dependent on a revival in the consumptive demand.

The low prices will probably tend to check the increase in flocks that has been noticeable in recent years. Pastoralists are now complaining that receipts are below the cost of production, and, as suggested above, one result is to increase the killings of sheep and lambs for export, though there is obviously a limit to the numbers which can be disposed of in this way at satisfactory prices. The increase in the flocks in the five large wool-producing countries, mentioned above, cannot be exactly determined, but the number certainly tended to increase between 1928 and 1930, although in 1929 and subsequently prices were on the downward grade as a result of reduced demand. Thus, a comparison of the number of sheep in 1930 with the number in 1928 shows that Australia had 106,100,000 against 103,431,000; New Zealand had 30,841,000 against 27,134,000; and South Africa had 47,100,000 against 42,500,000, while Argentina in 1930 reported 43,084,000 against the most recent previous estimate of 36,209,000 in 1922. In view of the decline in prices, it is reasonable to expect a reduction in the figures for 1931, or in any case a cessation of the rising tendency.

Potatoes.—The favourable prices obtained for potatoes this season have attracted relatively heavy imports, the receipts in the six months September, 1930, to February, 1931,

amounting to 1,915,000 cwt., a figure that is higher than in any year since 1924-25. Conditions this year are somewhat similar, and imports of old potatoes from Holland and Germany will probably be relatively large in the next two months. The balance of crop remaining in farmers' hands in Germany in the middle of January was three million tons more than at the corresponding date last year, but in the Netherlands stocks were decidedly smaller. Germany is also exporting appreciable quantities to France and elsewhere, but it is noticeable that receipts from Holland began to decline from the middle of February.

According to the returns of stocks on farms, about one-half the English crop had been sold by the end of the year, so that supplies were likely to be much reduced by the end of March, and there should be a good market till the end of the season. New potatoes have been obtainable since February, and from about the middle of March they began to arrive in larger quantities from the Canary Islands. The weather in Spain is reported not to have been very favourable, and deliveries may be later than usual, but the first shipment arrived from Malaga on March 16. Planting of the early potato crop in the Channel Islands was retarded by wet weather.

Cheese.—The price of English Cheddar, which often has a tendency to rise in the spring, showed an improvement towards the end of February, Dairy Cheddar, 1st quality, in London, moving up from 94*s.* to 102*s.* per cwt. in the first week of March, a figure that compares with 116*s.* at the same date last year. Both Canadian and New Zealand prices are much lower than last year, Canadian at 82*s.* per cwt. comparing with 103*s.* in March, 1930, and New Zealand at 62*s.* with 90*s.* 6*d.* These low prices for cheese adversely affect the manufacturing milk price, which during February was fixed as low as 5*d.* per gallon.

Imports from New Zealand since the opening of the season in November have amounted to 740,500 cwt. compared with 611,000 cwt. in the corresponding period (November-February) of 1929-30, while the shipments to arrive during March amount to 162,000 crates as against 124,250 crates in the same month last year. The total afloat on March 5 was 205,778 crates against 184,867 crates last year. The prospects are, however, for lighter supplies in future, and the estimated arrivals from June to September have been reduced. This may have a firming influence on prices. No appreciable quantities of Canadian cheese are now arriving, but stocks were reported

as 176,900 crates as compared with 145,700 crates last year.

A few consignments of cheese, amounting in January and February to about 1,000 cwt., have been received from South Africa, with the object of testing the possibility of establishing a regular export trade. The Dairy Control Board of South Africa is reported to be pressing for the export of a total of about 20,000 cwt., which is the estimated surplus available this year. Exported cheese enjoys a bounty of from 3*d.* to 3½*d.* per lb., which is paid by the Dairy Control Board out of a levy imposed on cheese made in or imported into South Africa.

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APRIL ON THE FARM

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Arable Land.—Spring-sown cereals that are not in the ground before the middle of this month seldom prove very satisfactory. Circumstances of weather or cropping may compel delays in sowing, and such delayed crops should be sown on a good tilth and adequately manured. If the land is not in high manurial condition, a balanced or complete fertilizer should be used; on land in high condition, the application of a small quantity of a quick-acting nitrogenous manure will be beneficial.

Land that has grown swedes or other sheep feed, and is not cleared until late in the month, should be sown daily as ploughed, the ploughing and sowing being kept well up to the sheep folds. An alternative to sowing cereals is to follow with a second root crop, and many fine crops of sugar-beet are grown in this way with a minimum of cultivations and manuring.

Seeding of clovers and grass seeds is an important job this month. The land should be well prepared and clean; a fine, firm seedbed is necessary, and the seeds should be sown before the cover or nurse crop is far advanced. Seeds for temporary or permanent pasture should have special care, as their initial success will influence their value throughout. The mixture of grasses and clovers should be suited to the soil and situation, and the use to which the grass is to be put. The fertility of the soil must be considered. Many disappointments arise from assuming that the manuring of grass can be left until it is known what sort of stand of seeds is obtained. Land that has been well manured for the preceding root crop, and particularly with lasting phosphates such as

basic slag, bone meal or flour, or mineral phosphates, or on which the roots have been fed, will usually be well prepared in this respect to nourish the seeds. Otherwise an application of phosphates on heavy land, and of phosphates and potash on the lighter soils, will be a wise practice. Small seeds, such as clovers and grasses, should not be deeply buried, but a covering of soil is beneficial, and a good practice is to sow the seeds on a rolled surface, give a light harrowing and again roll with a light roller. In order to avoid damage to the cereal crop the seeds should either be sown before the cereal crop is through the ground, or not until the second leaf has developed in the young plant.

Preparation for Root Crops.—No series of cultivations is more varied than that practised in spring to prepare the land for roots. The nature of the soil, the weather conditions, and the extent to which cleaning is required are all so variable that no general system can be planned beforehand. On the heavy soils, the main preparations should have been made in the previous autumn and the land left rough-ploughed during winter. Spring cultivation on heavy soils is confined to producing a tilth by cultivator and harrow without burying the soil that has been weathered to a tilth by frosts. Such a practice is often referred to as working up to a tilth. Light soils usually present no difficulty in obtaining a tilth—the problem on such soils being mainly one of getting the land thoroughly clean and producing a firm seedbed without undue loss of moisture.

It is well to remember that land left rolled down rapidly loses moisture; by keeping it rough and comparatively loose on the surface, the rainfall will percolate into the soil with a minimum of evaporation. The surface soil may, however, actually be drier and, after the seeds are sown, the land should be fairly firm on top or the young plants may suffer in their early stages from lack of moisture. Indifferent germination and slow growth can often be repaired by rolling after the plants are through the ground. Between the two extremes of soils referred to there is wide variation in soils and methods of dealing with them.

The standard of good cultivation generally accepted is based on three ploughings—one in autumn, a cross ploughing in early spring followed by frequent cultivations, and a third ploughing near seeding time. Such methods are well suited for a large proportion of soils, but it is quite impossible to lay down a rule as to what should or should not be done,

and it must be readily admitted that the British farmer is generally highly efficient in the cultivation of root crops. One may often experience circumstances that raise doubts as to what should be done, and a notable instance may be mentioned. In the spring of 1929 a severe frost set in during the second week in February at a time when much of the fallow land had been ploughed only once. The frost mellowed the surface soil to such an extent that an excellent tilth for seeding was easily obtained, and many farmers were reluctant to plough the land again and risk losing the tilth. The writer had occasion to examine in detail the cultivations for sugar-beet in that year on a large number of farms, and on nearly all the soils of a loam or heavy loam character the results were superior where one or two ploughings were given in spring after the frost.

Sugar-Beet.—This crop is highly responsive to good cultivations. It is sensitive to shortage of lime, and wherever land is in need of it there is no crop that will so quickly and surely give a return for expenditure on lime. Complete fertilizers are advisable, the whole being applied at or before seeding time. The weight of the crop is very much influenced by the number of plants per acre. This, in turn, is influenced by the width between the rows, the regularity at which the plants become established, and the spaces at which the plants are singled. In practice there does not appear to be much advantage in drilling closer than 18 inches, but on land where the tilth is not too good, or where weeds may give trouble, wider drilling at 20 or 22 inches provides better facilities for horse-hoeing without damaging the crop. It is false economy to sow less than 15 lb. of seed per acre with drills at 18 inches apart, and heavier seedings can be justified. Spaces between the plants will vary with the type and quality of the land, and possibly with the variety. Where the land or variety is not likely to produce large individual beets, closer spacing should be adopted.

Early Grass.—In favoured situations, grass may be available during the month. In a late spring, this month is often a difficult and expensive time for stock owners. Winter root crops and forage are exhausted, milk is at summer price and ewes with lambs must be well fed to keep the lambs thriving. The advantage of an earlier bite of grass is much appreciated. New pastures will usually produce earlier grass than old-established pastures, and this is not the least of the benefits of a rotation that includes temporary pastures. In recent

years, the campaign for more intensive manuring and grazing has convinced many farmers that applications of manures containing quick-acting nitrogen need not necessarily injure the quality of the pasture when the grazing is properly managed. The full system of intensified grass farming with repeated dressings of nitrogen throughout the season is still on trial, and may be a success under favourable conditions of soil and weather and where the produce of the stock, such as milk or early summer beef or lamb, has a market value commensurate with the increased cost.

A single dressing of complete fertilizers intended to improve the quality and quantity of produce, and in particular producing earlier growth, has a much wider application. Some fields are naturally much earlier than others. Fields that are fairly dry, well situated as to slope and shelter and in high manurial condition naturally produce earlier grass. Wet, cold fields having a northern aspect are at a disadvantage. There are certain limitations to the utilization of early grass. Unless the land is fairly dry, the sod may not be firm enough to carry cattle without doing injury to the land, and, in such cases, sheep are necessary. Cattle that have been wintered in stalls or yards may not be sufficiently acclimatized to stand the weather conditions that are likely to prevail. Sheep, especially ewes and lambs, are in the best position to make good use of early grass. Where the land will carry cattle, outwintered cattle derive full benefit, and it is one of the real advantages of the outwintering system that the stock are able to start earlier and progress in thriving and fattening without the setback that is so often experienced with cattle that have been housed during winter. Milk cows should be prepared for turning out by gradually lengthening the time they are out each day, and it may be worth while risking the treading of a small paddock to inure the cows to outside conditions in preparation for grazing as soon as the grass is available. Young stock that have been continually housed cannot be safely turned out till the weather is fit, no matter what the grass is like, and the younger the stock the more important it is to wait for favourable weather.

Early grass can easily be spoiled by overstocking. Nights are still comparatively cold and growth is not yet rapid. Severe and close grazing so early in the season may lower the production for the rest of the season, especially if dry weather is experienced in early summer. Dry pastures are well suited for the production of early grass, but the adoption of the

close-grazing system requires caution, and topping rough and long grasses with the mower is safer in dry weather than uniform close grazing.

Forage Crops.—The growth of grass throughout the season is far from uniform, especially in the eastern and southern districts. May and June are usually the best months of the year, July and August are very uncertain, and, except in dry seasons, September may bring about improved conditions. Milk yields are apt to fall rapidly in July, and supplementary feeding is usual. No better supplementary feeding can be adopted than the use of a green, succulent forage crop. Now is the time to prepare for these crops. Farmers who grow crops for ensiling can use their silage mixture. Such crops should not be allowed to become too ripe, but should be ensiled at the proper stage and the silage itself can be fed. Where ensilage is not practised a crop can be specially grown for forage purposes. A suitable mixture is 40 lb. of tares, 40 lb. of peas and 80 lb. of oats. If this mixture is sown before the middle of April, it will produce good forage just when grass is beginning to fail; if not required for this purpose it can be made into hay. Another successful practice is to substitute beans for tares, and if the crop is not required for forage it can be allowed to ripen, when a good mixed feed of beans, peas and oats is obtained that can be ground and used for winter feeding.

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NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
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Common Salt.—Salt figures with bones, lime and gypsum in the list of mineral manures used in very early times. With the introduction of potash fertilizers, however, the need for salt was much restricted, for not only did they supply potash direct instead of drawing upon the soil reserves, but they also contained a greater or smaller amount of salt in their own composition. It is known that salt is particularly important in relation to mangolds, sugar-beet, and potatoes, and some of the experimental evidence bearing on this question may be put on record.

On *mangolds* the effect is generally beneficial, and many experiments have shown that the addition of salt gives considerable increases in crop, these increases naturally being greatest where a high-grade source of potash, or no potash at all, was

used. Moreover, at least part of the effect must be attributed to the sodium in the salt; for if the nitrogen is supplied as nitrate of soda the salt effect is less than if sulphate of ammonia is used. Where the dry matter of the mangold has been determined, as was done for example in an extensive series of Danish experiments, it was found that salt tended to depress the proportion of dry matter (from 11·9 to 10·4 per cent. in these trials), but the loss was more than counterbalanced by a gain in yield.

On *sugar-beet* recent experiments have shown that salt has a beneficial effect on yield. The following results were obtained on a light soil at Colchester in 1928, all plots receiving superphosphate and sulphate of ammonia :—

No potash, no salt	5·92 tons per acre
1½ cwt. muriate of potash	6·49 „ „
3 „ agricultural salt	6·87 „ „
3¾ „ 20 per cent. potash salts ..	7·62 „ „

The muriate of potash and the salt each had a definite and, within the experimental error, an equal effect, but the potash salts containing both soda and potash were definitely better than either. At Rothamsted in the same year salt had a definite effect on sugar-beet which was most marked where sulphate of ammonia was used to provide nitrogen. The yields were :—

Mean of Two Varieties. All Plots having Muriate of Potash and Superphosphate

		No nitrogen	*Sulphate of ammonia*	*Nitrate of soda*
Roots (tons).	No salt	6·50	7·73	7·84
	With salt ..	6·97	8·41	8·03
Tops (tons).	No salt	4·33	5·62	5·89
	With salt ..	4·43	6·20	6·44

In the past season further evidence of the value of salt on sugar-beet has come to hand. At Colchester the addition of salt to muriate of potash was necessary to bring out the full effect of sulphate of ammonia, whereas nitrate of soda gave its full effect with muriate of potash alone. In two other experiments salt increased the roots, and in one it definitely increased the sugar percentage also.

On *potatoes* the effect of salt is harmful. Potash manures containing high proportions of salt have given no better yield, and in some cases definitely worse, than high-grade salts, while the quality has on the whole been inferior. In the Danish experiments mentioned above, common salt not only reduced the yield of potatoes, but markedly reduced the contents of dry matter (from 23·6 to 21·9 per cent.). Unlike

potash, one can expect no residual effect from common salt, for both the sodium and the chlorine are readily leached out.

It appears, therefore, that common salt is a valuable constituent of potash salts, in which it occurs in amounts varying from 29-77 per cent. by weight in potash salts containing 14 per cent. of K_2O, to 10-16 per cent. in muriate of potash. There is practically none in sulphate of potash. It is unlikely that agricultural salt will prove superior to a potash salt containing an equal amount of sodium chloride, and no doubt most farmers will obtain it as a constituent of their potash manures. Where crude salt is obtainable locally at favourable prices, however, it may be used with confidence for mangolds and sugar-beet.

Nitrogen for Cereals.—The prices for cereals at the time of writing are exceedingly low, but if corn is to be grown at all there is good reason to try for as heavy a crop as will stand. Artificial fertilizers should be used so long as the gain in crop is likely to more than balance the cost of the manure. About 4 bus. of wheat or 5 bus. of oats or 2½ bus. of malting barley are now necessary to cover the cost of the 1 cwt. of nitrogenous manure usually applied to these crops. These increases are still within what one may reasonably expect from nitrogenous fertilizers properly used, and there is also the value of the extra straw (from 4-6 cwt. per acre) to take into account as well as the benefit of getting a good cover for the ground and thus keeping down weeds. Winter corn may still receive this dressing with advantage. For spring corn sulphate of ammonia is best put in the seedbed, but a top-dressing of nitrogenous manure may still be given at this time either wholly or in part in the form of nitrate, *i.e.*, as nitrate of soda, nitrate of lime, or nitrochalk, but this should be done at the earliest opportunity.

Mixed Fertilizers.—The manufacture of mixed fertilizers continues to develop both at home and abroad. The series of mixed fertilizers now being introduced by Imperial Chemical Industries differ from the ordinary mixed fertilizers commonly used by farmers in that, instead of being based on superphosphate containing 16 per cent. of water-soluble phosphoric acid, they are based on mon-ammonium phosphate, a substance containing about 63 per cent. of water-soluble phosphoric acid and 12 per cent. of nitrogen. They are also in granular form. Where much dung is available and soils are heavy, cereals and turnips may well be grown on phosphate and

nitrogen alone. There is, therefore, a series of ammonium phosphate fertilizers giving various ratios of nitrogen to phosphoric acid from which a balance can be selected to suit the particular conditions. To vary the proportions of nitrogen and phosphoric acid, sulphate of ammonia is added to the ammonium phosphate, so that the more sulphate included, the lower will be the proportion of phosphoric acid to nitrogen. Thus at one end of the scale there is a mixture containing 18 per cent. of N and 18 per cent. of P_2O_5, one part of nitrogen being associated with one part of water-soluble phosphoric acid; and at the other end the corresponding figures are 12·3 per cent. N, 56·5 per cent. P_2O_5, 1 of nitrogen to 4½ parts of phosphoric acid. These ratios would correspond to mixtures of 1 part sulphate of ammonia with 1¼ of superphosphate, and 1 part of sulphate of ammonia with 5½ parts of superphosphate respectively. The actual percentages of nutrients in these superphosphate mixtures would, in round figures, be 9 per cent. each of N and P_2O_5 in one case and 3 per cent. N and 13½ per cent. P_2O_5 in the other. It will be noticed that the first ammonium phosphate mixture is twice as concentrated as its counterpart containing superphosphate, and the second is four times as concentrated as the corresponding superphosphate mixtures.

For more general conditions, on light and medium soils, and for root crops intensively treated, potash will also be required in addition to nitrogen and phosphate. This is arranged by mixing salts of potash with the ammonium phosphate series. These mixtures contain about 40 units of water-soluble nutrients, the nitrogen ranges from 6·5 to 12·5 per cent., water-soluble phosphoric acid from 10·4 to 26 per cent., and potash from 7·5 to 20·8 per cent.

Taking as an example the fertilizer recommended for main crop potatoes under general conditions, it contains 10·4 per cent. of N, 10·4 per cent. of water-soluble P_2O_5 and 20·8 per cent. of K_2O. The ratio of nutrients is 1 : 1 : 2 and is the same as would be obtained by mixing 1 part of sulphate of ammonia, 1¼ parts superphosphate and ⅝ part sulphate of potash. The latter mixture would contain about 6½ per cent. N, 6½ per cent. P_2O_5 and 13 per cent. K_2O. Hence 2 cwt. of the ammonium-phosphate compound would provide the same amounts of plant food as 3 cwt. of the mixture of ordinary fertilizers.

Since ammonium phosphate has not hitherto been used on a large scale in this country, comparative trials of fertilizers

based on this substance are required over a wide range of conditions, and these have been in progress and are being continued. High-grade complete fertilizers are also being introduced elsewhere, notably in Germany and the United States, and in the former country a very large tonnage of this type of material is used.

Analyses of a few of the grades of such compound fertilizers may be of interest :—

	Percentage			
	N.	P_2O_5	K_2O	Total units
Nitrophoska	17·5	13	22	52
	15	11	26·5	52
	16·5	16·5	20	52
	15	30	15	60
Ammophosko	12	24	12	48
	9	18	18	45
	10	30	10	50
I.C.I.	12·5	12·5	15	40
	10·4	10·4	20·8	42
	10·4	20·8	10·4	42
1 part sulphate of ammonia, 1 part superphosphate, 1 part sulphate of potash ..	6·9	5·3	16	28
1 part sulphate of ammonia, 4 parts superphosphate, 1 part sulphate of potash ..	3·3	10·6	8	22

In order to meet the needs of varying conditions a few quite distinct "balances" of nutrient in mixed fertilizers are necessary. Farmers who have determined the needs of their soil with some exactness will have their own ideas about the fertilizer prescriptions they require. Simple calculation will show what is the percentage of nitrogen, phosphoric acid and potash in the mixture decided upon. It is then for the individual to decide whether he will make up this mixture himself or use a ready-made compound of approximately the same analysis.

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PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended March 18				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	10 0*d*	10 0*d*	10 0*d*	10 0*d*	12 11
Nitro-chalk (N. 15½%) ..	*	9 7*d*	9 7*d*	9 7*d*	9 7*d*	12 1
Sulphate of ammonia :—						
Neutral (N. 20·6%) ..	*	9 10*d*	9 10*d*	9 10*d*	9 10*d*	9 3
Calcium cyanamide (N. 20·6%)	*	8 18*e*	8 18*e*	8 18*e*	8 18*e*	8 8
Kainit (Pot. 14%)	§	3 8*a*	2 19*a*	2 19*a*	3 3*a*	4 6
Potash salts (Pot. 30%) ..	§	5 6*a*	4 18*a*	5 0*a*	4 19*a*	3 4
,, (Pot. 20%) ..	§	3 17*a*	3 9*a*	3 8*a*	3 12*a*	3 7
Muriate of potash (Pot. 50%)	§	9 17*a*	9 3*a*	9 2*a*	9 5*a*	3 8
Sulphate,, ,, (Pot. 48%)	§	11 19*a*	11 6*a*	11 5*a*	11 5*a*	4 8
Basic slag (P.A. 15¾%)‖ ..	§	2 13*c*	2 3*c*	..	2 9*c*	3 1
,, (P.A. 14%)‖ ..	§	2 7*c*	1 16*c*	1 16*c*	2 3*c*	3 2
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	§	3 11	..	3 9	3 1	3 10
,, (S.P.A.13¾%)	§	3 5	2 18	3 3	2 15	4 0
Bone meal (N.3¾%, P.A.20¼%)	§	8 15	7 10	7 0	6 10	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	5 5*f*	6 0	4 7	..
Burnt lump lime	§	1 5*l*	1 2*m*	1 9	1 17*h*	..
Ground lime	§	1 12*l*	1 8*m*	..	1 12*h*	..
,, limestone	§	1 3*l*	1 6*g*	1 7*k*	..	..
,, chalk	§	..	1 6*g*	..	1 11*h*	..
Slaked lime	§	..	..	2 9	2 17*h*	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, for delivery during the month, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85%, through standard sieve.

a Prices for 4-ton lots f.o.r.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g F.o.r. Knottingley. Ground limestone 100% through standard sieve.

h Carriage paid 6-ton lots London, bags included.

k In bags, f.o.r. Liverpool. Fineness 45% through standard sieve.

l Carriage paid 6-ton lots Bristol.

m Carriage paid 6-ton lots Knottingley.

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NOTES ON FEEDING STUFFS

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Store Cattle.—A problem now seriously affecting the farmers of the Midlands is how to cope with the difficulty that suitable store stock are scarce and dear in the spring, and that grass fed cattle make lower prices per cwt. in the autumn. This is no new problem, but it has become aggravated in the last few years by the putting down of more land to grass, the shrinkage in the arable and the root-feeding areas, and consequently reduced facilities for the wintering of store stock.

To one concerned with this problem the results of the investigations made in connexion with the management of store cattle in Aberdeenshire are of special interest. As Capt. Symon* has said, these trials emphasize the need for looking closely into existing methods, with the object of effecting adjustments to meet present-day conditions.

Those of us who are engaged in the rearing of store cattle in the Midlands are especially struck by the large quantities of turnips consumed by the store cattle in the Aberdeenshire trials. It is surprising to find that young cattle—18 to 24 months old—consumed in the neighbourhood of 120 lb. of turnips per day, not only without harm but with satisfactory increase in live weight. On this quantity of roots, coupled with oat straw alone, store cattle increased in live weight 1·3 lb. per head per day between November 6 and July 2, when kept in the fields with open-fronted shelter sheds. The outdoor cattle consumed very nearly twice as much turnips daily as did the "inside" cattle, and put on additional weight to the amount of 1 cwt. per head as calculated at the end of the first part of the summer grazing period. These results indicate that for conditions in the N.E. of Scotland, an open shed in the fields provides a more suitable type of winter accommodation for store cattle than the comparatively close and warm "byre" or "covered court."

As regards the feeding of concentrates to the cattle in these trials, results of more interest to the English grazier might have been obtained if the concentrates had not been dropped at the end of March. The cattle would naturally receive a check at the time the concentrates were stopped. The opinion of Midland graziers, backed up by such evidence as has been obtained on the farm at Moulton, is that when

* *Scottish Journal of Agriculture*, Oct., 1930.

concentrates are fed to store stock in winter, it is advisable to continue the concentrates until the cattle are well used to the early summer grass—say up to the second week of May. In the case of store stock housed in winter and given concentrates, it appears to be sound practice to turn out these cattle to grass early—say about the middle of April—and to bring them in overnight for the first fortnight or three weeks, meanwhile continuing to feed dry food—hay alone or hay and concentrates—until the cattle have become accustomed to the grass. By taking such precautions it has been found possible to graze young cattle of about two years old even on some of the richer old permanent grass-lands, which are generally reputed to be too strong except for mature bullocks.

Raising of Store Cattle, Moulton.—A record of the weights of store stock, steers intended for fattening, and heifers intended for breeding, has been kept for several seasons on Moulton Experimental Farm. Generally speaking, these weighings have shown that cattle on grass will increase in live weight up to about the end of October without any supplementary feeding. In November they have maintained their live weight, and from about December 1 will sink in live weight unless given extra feeding.

The graph on p. 103 illustrates the results obtained with six home-bred Shorthorn steers for the period from April 24, 1930, to March, 1931. These steers were calved in 1929 out of Shorthorn dairy cows with records of milk yields up to 1,000 gal.,' and got by a bull out of a 1,000-gallon cow. From these figures it will be gathered that the stock from which the steers were bred were selected primarily for dairy qualities. The steers represent, however, the average "dairy" or "dual-purpose" shorthorn type of this area.

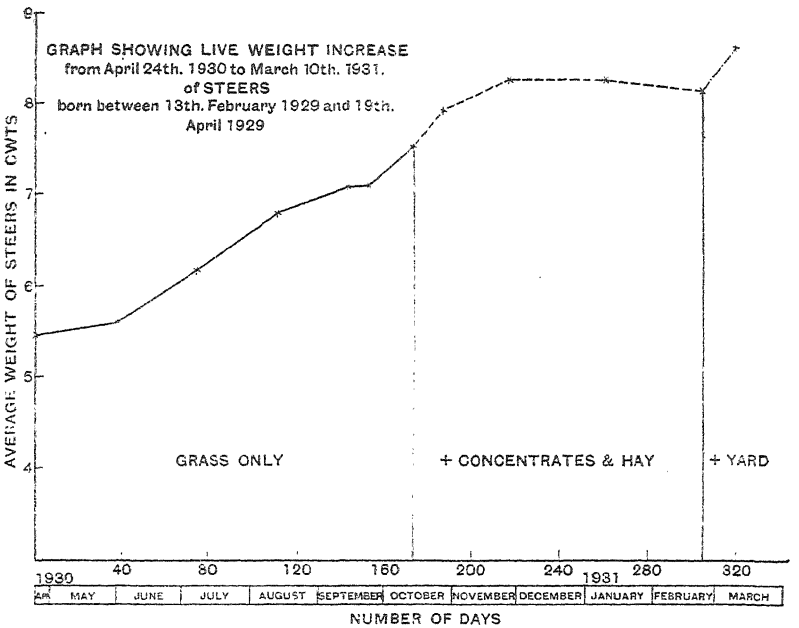
The steers were kept out-of-doors, without any protection except the natural shelter of trees and hedges, until February 17. On this date they were brought into a covered yard, open to the south, and allowed to go out daily.

The details of their feeding are as follows. Beginning on October 14 they were given, per head per day :—

1 lb. Cotton Cake.
1 lb. Maize Germ Cubes.
5 lb. Hay.

After November 29 they received 2 lb. per head per day of one or other of the following mixtures :—

1 part Decorticated Ground Nut Cake *or* Soya Treacle Cubes.
2 parts Maize Germ Cubes.



The Raising of Store Cattle, Moulton Experimental Farm, Northampton
(*See* page opposite).

The hay was gradually increased so that by the end of December the daily amount fed was 10 lb. per head. By January 15 the hay allowance had increased to 12 lb. and remained at this figure until February 17. After being brought into the yard on February 17 the allowances of concentrates and hay were slightly increased.

It will be seen from the graph that from the middle of November the steers practically stood still as regards weight and began to lose ground after the middle of January. After being brought into the covered yard there was a very marked increase in weight. Throughout the whole period the steers kept their coats and looked healthy, but were beginning to lose " bloom " just before being brought under cover.

Winter Fattening of Cattle.—A study of the history of cattle feeding in this country suggests that for the last seventy years there has been a tendency—more marked in certain quarters than in others—to feed excessively large quantities of cakes. The late Prof. T. B. Wood and the late K. J. J. Mackenzie

drew attention to this wasteful practice. Prof. T. B. Wood's figures, given below, have been used by the writer as a basis for calculating rations for fattening cattle for a number of seasons, with results that give confidence in recommending their more general adoption :—

MAINTENANCE RATIONS

Live Weight *cwt.*	*Appetite of animal dry matter* *lb.*	*Starch equivalent* *lb.*
7	19	5·0
8	20½	5·5
9	22	6·0
10	23½	6·5
11	25	7·0
12	26½	7·4
13	28	7·8
14	29½	8·1
15	31	8·4

PRODUCTION RATION

Age *Years*	*Conditions*	*Weight of starch equivalent required to produce 1 lb. of live-weight increase* *lb.*
About 1½ ..	Stores ..	2
„ 2 ..	„ ..	2¼
„ 2½ ..	„ ..	2½
„ 2½ ..	Half-fat ..	3
„ 2½ ..	Nearly-fat ..	4

PROTEIN REQUIREMENT

	Per day
The Protein Requirement does not exceed ..	1½–2 lb. P.E.

If evidence were required of the general approximate correctness of these figures, this evidence would be obtained from the practice of the leading cattle feeders of the N.E. of Scotland, both of a bygone and the present generation. The most successful of the cattle feeders of two-year-old "Polled Scots" for the London Market have never been extravagant users of oil cakes—rather they have relied on good turnips and straw and home-grown cereals, with the possible addition of bran. We find, for example, that bran was practically the only purchased feeding stuff that found its way to the farm of Keillor, at a time when Hugh Watson was making cattle-feeding history. Another well-known cattle feeder of the North, writing in 1891, refers to the sharp fall that occurred in the price of beef cattle between 1883 and 1887. He states that after the fall in price he could no longer afford to feed oil cakes, and instead he fed his own home-grown crushed oats with a wineglassful of linseed oil daily. He was surprised to find that his cattle had done better fed in this way with turnips

and straw, than they had done when given a liberal allowance of cake.

It is true that the usual figures given for the analyses of turnips and straw would show some deficiency in protein, even when oats are included in the ration, but it must be recognized that the usual figures given in food tables hardly do justice to the straw and turnips of the North-East. Actually, the feeding value of such straw, in practice, approaches that of meadow hay.

Taking the sort of basal ration common in arable areas in England to be something like the following, and adding to this ration 1 lb. of a protein-rich cake, the necessary supply of protein to a fattening beast can be ensured :—

	Dry matter	*Starch equivalent*	*Protein equivalent*
56 lb. Swedes	6·44	3·92	·39
14 lb. Seeds hay ..	12·04	3·36	·69
7 lb. Oat straw ..	6·02	1·19	·06
Total ..	24·50	8·47	1·14
1 lb. Decorticated Ground-nut Cake	·90	·73	·41
	25·40	9·20	1·55

This ration should be sufficient for an 11 cwt. beast in "fresh" condition to put on just under 1 lb. live-weight increase per day. An addition of 2 lb. of oats and 2 lb. of barley, supplying together 2·26 lb. S.E., should be sufficient to give an additional increase of about 1 lb. daily.

	Dry matter	*Starch equivalent*	*Protein equivalent*
Swedes, hay, straw, D.G.N. cake ..	25·40	9·20	1·55
2 lb. Oats	1·73	1·20	·15
2 lb. Barley	1·70	1·42	·12
	28·83	11·82	1·82

If the actual requirement in dry matter should be exceeded by adding the oats and barley, the skilful feeder would control this by reducing the amount of straw, or the beast might control it by leaving a portion of the straw uneaten.

In any case there is no need to increase the cake or protein-rich food ; it will be sufficient to increase the hay or to give additional oats or barley or wheat or other food of high starch value, at the same time reducing the straw, if a more rapid rate of increase is desired.

The following is a fattening ration with very good meadow hay :—

	Dry matter	*Starch equivalent*	*Protein equivalent*
21 lb. Very good Meadow Hay	17·64	8·40	1·64
2 lb. Oats	1·73	1·20	0·15
2 lb. Barley	1·70	1·42	0·12
	21·07	11·02	1·91

This ration would theoretically be sufficient for a 9 cwt. beast to put on 1½–2 lb. live-weight increase per day. In practice there might be hardly sufficient bulk. An observant stockman, however, would realize this if the beast were not sufficiently contented, or were eating the bedding ; he would correct it in the obvious way.

21 lb. of good clover hay, or 21 lb. of well-got lucerne hay, or 21 lb. of first quality meadow hay will in each case supply roughly 1½ lb. protein equivalent. An allowance of this quantity of either of these kinds of hay will supply all the protein that a fattening beast requires.

Much saving in food bills could certainly be effected by utilizing to the fullest advantage home-grown cereals and well-got hay. The farmer is constantly being inundated with propagandist literature advocating this or that proprietary cake, and more recently this or that balanced cube. Not infrequently the balanced cubes are recommended as made up according to a prescription supplied by some reputed authority on feeding. There is need therefore, in the farmer's interests, for a fuller appreciation of good home-grown food-stuffs—high quality hay and wholesome cereals. If the arable farmer buys any feeding stuffs at all, it would be well, taking current values into consideration, if he were to restrict his purchases to those single articles or so-called " straight " feeding stuffs that he may occasionally require to supply protein to give the necessary balance.

A protein-rich concentrate, such as decorticated ground nut cake, and some bran, because of its special properties, should generally constitute all that the arable land farmer requires for the indoor winter feeding of cattle. If a farmer is short of cereals, or, in the case of the grassland farmer, has none of his own, he might carefully consider day to day values of feeding stuffs. Nowadays he will often find that the products of English farms are the most economical foods to buy.

It is true that cubes are of special value for out-door feeding, economising loss due to wind and weather, and reducing the need for troughs. It would be of great advantage therefore to those who are feeding stock out of doors if inexpensive means of cubing cereals could be devised. The special usefulness of cubes applies in the feeding of sheep and pigs out of doors as well as in cattle feeding.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	4 5
Maize	81	6·8	4 19
Decorticated ground nut cake	73	41·0	7 10
„ cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·18 shillings, and per unit protein equivalent, 1·86 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 3
Oats	60	7·6	4 5
Barley	71	6·2	4 15
Potatoes	18	0·6	1 2
Swedes	7	0·7	0 9
Mangolds	7	0·4	0 9
Beans	66	20·0	5 15
Good meadow hay	37	4·6	2 12
Good oat straw	20	0·9	1 5
Good clover hay	38	7·0	2 18
Vetch and oat silage	13	1·6	0 18
Barley straw	23	0·7	1 8
Wheat straw	13	0·1	0 15
Bean straw	23	1·7	1 10

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6d. net.

Description	Price per qr.		Price per ton	Manurial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	5 0	0 11	4 9	72	1 3	0·67	9·6
Barley, British feeding	—	—	5 10	0 9	5 1	71	1 5	0·76	6·2
„ Danubian	15 9	400	4 8*	0 9	3 19	71	1 1	0·58	6·2
„ Persian	15 0	„	4 3	0 9	3 14	71	1 1	0·58	6·2
„ Russian	15 9	„	4 8	0 9	3 19	71	1 1	0·58	6·2
Oats, English, white	—	—	6 0	0 10	5 10	60	1 10	0·98	7·6
„ „ black and grey	—	—	6 0	0 10	5 10	60	1 10	0·98	7·6
„ Canadian Mixed Feed	11 9	320	4 2*	0 10	3 12	60	1 2	0·62	7·6
„ Argentine	11 9	„	4 2	0 10	3 12	60	1 2	0·62	7·6
„ Chilian tawny	13 6	„	4 15	0 10	4 5	60	1 5	0·76	7·6
„ German	20 3	„	7 2†	0 10	6 12	60	2 2	1·16	7·6
„ Russian	13 6	„	4 15	0 10	4 5	60	1 5	0·76	7·6
Maize, Argentine	19 0	480	4 8	0 9	3 19	81	1 0	0·54	6·8
„ South African	23 6	„	5 10†	0 9	5 1	81	1 3	0·67	6·8
Peas, Indian	—	—	8 0†	1 0	7 0	69	2 0	1·07	18
„ Japanese	—	—	16 15†	1 0	15 15	69	4 7	2·45	18
Dari	—	—	8 0	0 11	7 9	74	2 0	1·07	7·2
Milling offals—									
Bran, British	—	—	4 12	1 0	3 12	42	1 9	0·94	10
„ broad	—	—	5 12	1 0	4 12	42	2 2	1·16	10
Middlings, fine, imported	—	—	5 7	0 16	4 11	69	1 4	0·71	12
„ coarse, British	—	—	4 12	0 16	3 16	58	1 4	0·71	11
Pollards, imported	—	—	4 2	1 0	3 2	60	1 0	0·54	11
Meal, barley	—	—	5 12	0 9	5 3	71	1 5	0·76	6·2
„ maize	—	—	5 12	0 9	5 3	81	1 3	0·67	6·8
„ „ South African	—	—	5 10	0 9	5 1	81	1 3	0·67	6·8
„ „ germ	—	—	5 15	0 14	5 1	85	1 2	0·62	10
„ locust bean	—	—	5 5	0 7	4 18	71	1 5	0·76	3·6
„ bean	—	—	8 7	1 3	7 4	66	2 2	1·16	20
„ fish	—	—	18 0	3 0	15 0	53	5 8	3·04	48
Maize, cooked flaked	—	—	6 15	0 9	6 6	83	1 6	0·80	8·6
„ gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	9 10	1 7	8 3	74	2 2	1·16	25
„ „ „ 9% „	—	—	9 2	1 7	7 15	74	2 1	1.12	25
„ „ „ 8% „	—	—	8 17	1 7	7 10	74	2 0	1·07	25
Soya bean cake, 5½% oil	—	—	7 17*	1 18	5 19	69	1 9	0·94	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	5 5	1 5	4 0	42	1 11	1·03	17
„ „ Egyptian, 4½% „	—	—	4 17	1 5	3 12	42	1 9	0·94	17
Decorticated cottonseed meal, 7% oil	—	—	9 10*	1 18	7 12	74	2 1	1·12	35
Ground-nut cake, 6-7% oil	—	—	5 12*	1 6	4 6	57	1 6	0.80	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 10*	1 19	5 11	73	1 6	0·80	41
Palm kernel meal, 1-2% „	—	—	5 2	0 17	4 5	71	1 2	0·62	17
Feeding treacle	—	—	5 15	0 9	5 6	51	2 1	1·12	2·7
Brewers' grains, dried ale	—	—	4 5	0 17	3 8	48	1 5	0·76	13
„ „ „ porter	—	—	3 17	0 17	3 0	48	1 3	0·67	13
Malt culms	—	—	5 0†	1 5	3 15	43	1 9	0·94	16
Dried sugar beet pulp (*a*)	—	—	4 2	0 9	3 13	65	1 1	0·50	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of February, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 8s. 8d.; P_2O_5, 2s. 10d.; K_2O, 3s. 4d.

MISCELLANEOUS NOTES

Scholarships for the Sons and Daughters of Agricultural Workmen and Others

THE Ministry invites applications for the under-mentioned Scholarships which are offered for award this year. About 130 Junior scholarships (including 10 Extended Junior awards for those who have already held Junior scholarships), tenable at farm institutes for short courses not exceeding one year, in agriculture, horticulture, dairying or poultry-keeping.

Ten Senior scholarships, tenable at agricultural colleges or university departments of agriculture for diploma or degree courses, and at veterinary colleges for courses in veterinary science.

The scholarships, which are open to *bona fide* workers in agriculture and to the sons and daughters of agricultural workmen or of other rural workers who are in a similar economic position, cover the whole cost of instruction and maintenance during the period covered by the awards; normally there should be no expense to be borne by either the selected candidates or their parents.

No written examination is held in connexion with these awards. Selection is by interview, and candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of instruction.

Since the commencement of the scheme in 1922, some 1,096 scholarships have been awarded. These scholarships offer, to those who are prepared to work with diligence, the means of qualifying for better-paid and more interesting posts. Many of those who have received awards have improved their positions substantially, and a number have obtained important posts in the industry.

Full information concerning the Scheme, including forms of application and a leaflet outlining the careers open to scholars, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1, or locally from the offices of County Councils. Applications should be sent, to the County Authority for Agricultural Education for the county in which the applicant resides, not later than April 30, 1931.

Travelling Research Fellowships and International Conference Grants, 1931

ON the recommendation of the Advisory Committee on Agricultural Science, the following awards of travelling research fellowships and international conference grants tenable in 1931 have been made by the Ministry :—

(1) A grant of £250 to Dr. J. Henderson Smith of Rothamsted Experimental Station for a visit to the U.S.A. to study work in progress on virus diseases and to confer with virus experts.

(2) A grant of £250 to Mr. F. R. Petherbridge of the School of Agriculture, Cambridge, for a visit to the U.S.A. and Canada to study pest control methods, especially spraying and dusting technique.

(3) A grant of £250 to Mr. J. A. Venn of the School of Agriculture, Cambridge, for visits to the U.S.A., New Zealand and Japan to study the organization of teaching and research in agricultural economics.

(4) A grant of £30 to Mr. K. A. H. Murray of the Agricultural Economics Research Institute, Oxford, for a visit to Germany to study work on agricultural prices and statistics.

(5) A grant of £75 to Dr. W. E. Brenchley of Rothamsted Experimental Station for a visit to the U.S.A. to study methods of dealing with plant nutrition problems.

(6) A grant of £75 to Dr. W. F. Bewley of the Experimental and Research Station, Cheshunt, for visits to France and Holland to study the cultivation of early vegetables and flowers.

(7) A grant of £40 to Dr. R. Stenhouse Williams of the National Institute for Research in Dairying, for a visit to Denmark, Sweden and Finland, to attend the International Dairy Congress, Copenhagen, and to study dairying practice in Sweden and Finland.

(8) Grants of £25 each to Mr. J. Hammond of the Animal Nutrition Institute, Cambridge, Mr. J. Golding and Mr. J. Mackintosh of the National Institute for Research in Dairying, and Mr. H. T. Cranfield of the Midland Agricultural College for attendance at the International Dairy Congress, Copenhagen.

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Agricultural and Veterinary Research Scholarships

THE Ministry invites applications for research scholarships in agricultural and veterinary science. The scholarships are tenable for three years from October 1, 1931, and are of the value of £200 per annum; extra allowances may be made for travelling and subsistence for periods spent abroad. The number to be awarded will not exceed seven and will depend upon the qualifications of the candidates.

Applications must be received not later than June 15, 1931, on the prescribed form (900/T.G.) which, together with a copy of the conditions attaching to the scholarships, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

* * * * * *

Agricultural Research Grants

THE Ministry is prepared to receive, not later than May 15 next, applications for grants in aid of scientific investigations bearing on agriculture, to be carried on in connexion with a university, university college or other approved institution or society in England and Wales during the academic year commencing October 1, 1931. The conditions on which these grants are offered are set out in the prescribed form of application (A.53/T.G.), copies of which may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

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Agricultural Scholarships

THE Ministry invites applications for agricultural scholarships from students who propose to take up posts as agricultural organizers, teachers or lecturers in agriculture, etc. The scholarships are tenable for two years from October 1, 1931, the second year of which will normally be spent abroad. The value of the scholarships will vary according to the scholar's means, but will not exceed £200 per annum whilst the scholar is in this country; extra allowances may be made for travelling and subsistence for periods spent abroad. The number to be awarded will not exceed five and will depend upon the qualifications of the candidates. Applications can be received up to June 15, 1931, on the prescribed form (A.472/T.G.) which, together with a copy of the conditions attaching to the scholarships, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

* * * * * *

Stud Goat Scheme, 1931-32

THE Ministry has decided to continue for another season the scheme for the improvement of milch goats kept by cottagers, smallholders and others of similar position. Under this scheme, persons in the above-mentioned categories are enabled to procure the services of first-class stud goats for breeding purposes at a maximum fee of 5s. per service. As in previous years, a grant will be made to the British Goat Society to cover the payment of premiums and certain administrative expenses. Stud goats cannot be accepted unless they have been entered, or are considered eligible for entry, in the Society's Herd Book and they must be from proved milk-producing or imported stock.

Owners desirious of having stud goats registered under the scheme should make early application to the Secretary of the

British Goat Society, Roydon Road, Diss, Norfolk, who will be pleased to furnish full particulars and application forms. Applicants need not be members of the Society. Entries must be received on or before May 20, 1931, after which date any goat submitted for approval must be available for inspection at the premises at which it is proposed it should stand at stud.

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Production of Home-Grown Beet-Sugar

ACCORDING to returns made to the Ministry by the beet-sugar factories operating in Great Britain, the total quantity of home-grown beet-sugar manufactured during February, 1931, together with the quantity produced during the corresponding month in 1930, was :—

	cwt.
February, 1931	114,123
February, 1930	167

The total quantities of sugar produced during the two manufacturing campaigns to the end of February were :—

	cwt.
1930/31	8,485,618
1929/30	5,799,696

* * * * * *

The Humbert-Marie José Prize

THE Ministry has received from the President of the International Institute of Agriculture a copy of the regulations governing the award of the Humbert-Marie José Prize for the best work on agricultural economics. The prize, which is of the value of 10,000 lire and is to be awarded annually, was instituted on the occasion of the marriage of H.R.H. the Crown Prince of Italy with H.R.H. the Princess Marie José of Belgium. The closing date for the submission of works is September 30 next, and the prize will be awarded for the first time on December 31, 1931. Only works published during the two preceding years by authors belonging to countries adhering to the Institute are admissible. The adjudication will be in the hands of a jury of five members comprising the President of the Institute and four members nominated by the Permanent Committee from among members of the International Agricultural Scientific Council and the Agricultural Economics Council, in such a manner that the jury is composed of members belonging to five different nationalities. Copies of the regulations and all further information may be obtained on application to the President, International Institute of Agriculture, Rome.

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended December, 1930, compared with the corresponding period of 1929. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	Oct. to Dec., 1930		Oct. to Dec., 1929	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	2	250	18	1,780
Belgium	111	2,665	22	892
Brazil	2	500	8	520
Colombia	0	0	7	1,190
Russia	0	0	194	12,305
Australia	29	2,642	23	6,120
British India	6	435	12	650
Irish Free State	567	9,934	634	11,064
Kenya	14	726	20	926
Union of South Africa	28	2,061	38	2,346
Other countries	57	3,481	22	1,341
Total	816	22,694	998	39,134
SHEEP AND LAMBS				
Argentina	240	7,235	459	15,675
Brazil	2	95	37	1,118
Chile	95	2,271	81	5,675
Peru	0	0	30	714
Russia	0	0	1,393	10,524
Spain	26	410	0	0
Uruguay	119	3,245	224	5,079
Australia	32	606	65	1,104
Falkland Islands	0	0	30	1,300
Irish Free State	599	2,865	74	668
Other countries	62	543	40	563
Total	1,175	17,270	2,433	42,420
SWINE				
Belgium	5	145	11	210
France	6	111	6	120
Germany	63	1,347	5	106
Japan	2	273	0	0
Latvia	11	330	0	0
Peru	0	0	10	192
Australia	0	0	55	2,273
British India	4	200	0	0
Irish Free State	7	38	119	476
Other countries	18	366	24	640
Total	116	2,810	230	4,017

Export of Breeding Stock in 1930

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland during 1930, with comparative figures for 1929. (From "Annual Statement of Trade" and returns supplied by H.M. Customs and Excise.)

Country to which exported	1930		1929	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	198	29,978	242	53,248
Belgium	309	8,571	22	892
Brazil	31	3,085	102	9,204
Russia	0	0	194	12,305
Uruguay	57	9,330	65	12,025
United States of America	86	7,624	30	3,250
Australia	129	13,865	85	20,481
Canada	232	15,770	354	30,576
Irish Free State	1,947	44,837	2,198	48,332
Southern Rhodesia	42	3,465	95	7,092
Union of South Africa	89	6,235	102	6,560
Other countries	153	9,614	186	13,705
Total	3,273	152,374	3,675	217,670
SHEEP AND LAMBS				
Argentina	576	13,885	868	25,625
Brazil	97	2,110	175	4,122
Chile	125	3,892	151	9,084
France	94	1,022	188	1,964
Russia	0	0	1,393	10,524
Uruguay	284	6,839	336	7,975
United States of America	239	3,851	140	2,242
Canada	416	6,589	277	2,643
Irish Free State	822	4,342	405	1,993
Other countries	263	4,488	350	7,873
Total	2,916	47,018	4,283	74,045
SWINE				
Belgium	32	608	13	260
Denmark	12	270	54	1,079
Egypt	75	275	0	0
Germany	78	1,868	31	353
Hungary	0	0	63	888
Japan	19	772	1	40
Poland	11	257	24	499
Australia	14	477	68	2,837
Irish Free State	228	3,051	307	1,629
Other countries	104	2,446	157	3,276
Total	573	10,024	718	10,861

The Housing of Goats

WEATHER conditions in this country render it necessary for goats to be stabled during a great part of the year, and successful goat-keeping depends to a large extent on the suitability of the accommodation provided. The Ministry has accordingly prepared plans of a model house for two goats and a fodder store, designed on thoroughly hygienic lines, and with due regard for considerations of economy in material and space. Copies of this plan may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3d. each (4d. post free).

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The Agricultural Index Number

THE general level of the prices of agricultural produce during February was 26 per cent. above pre-war as compared with 30 per cent. in January and 44 per cent. a year ago. The chief cause of the fall of 4 points in the index number was the weakness in prices for wheat, fat cattle, sheep and pigs, these commodities showing a rise, as a rule, at this period of the year.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	—
April	52	43	51	46	37	—
May	50	42	54	44	34	—
June	48	41	53	40	31	—
July	48	42	45	41	34	—
August	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—The average price of wheat at 5*s.* 1*d.* per cwt. was 6*d.* per cwt. lower on the month and the index number at 31 per cent. below 1911–13 was 7 points lower than in January. Barley and oats were both 1*d.* per cwt. dearer, but while the index for the former was unchanged at 3 per cent. above pre-war, that for oats was 2 points lower at 18 per cent. below 1911–13 owing to a relatively greater increase having occurred

in the base period. As compared with February, 1930, wheat was cheaper by 3*s*. 11*d*. per cwt. and oats by 8*d*., but barley was 3*d*. dearer.

Live Stock.—Practically all descriptions of live stock sold at lower rates than in the previous month. Fat cattle were cheaper by about 6*d*. per cwt. and the index figure was reduced by 2 points to 25 per cent. above the base level while fat sheep were ¼*d*. per lb. lower and the index at 37 per cent. over pre-war showed a reduction of 13 points. The average price of bacon pigs was unchanged on the month, but the index fell by 3 points to 31 per cent. over 1911–13 owing to a rise in price having occurred in the base period, while a reduction of 3*d*. per score lb. in the quotation for pork pigs was reflected in a drop of 6 points in the index number to 51 per cent. over pre-war. Dairy cows were rather cheaper and store cattle slightly dearer, but the index numbers were little altered at 32 and 29 per cent. respectively over the base period. The indices for store sheep and pigs, however, showed considerable reductions, the former declining by 13 points to 35 per cent. and pigs by 16 points to 98 per cent. above pre-war. The sharp fall in the latter case, however, was due more to an increase in price in February, 1911-13, than to the reduced price this February.

Dairy and Poultry Produce.—The contract price of milk during February averaged the same as in January and the index figure was unaltered at 62 per cent. over the base period. Butter also was unaltered in value, but the index appreciated by 2 points, while cheese, although slightly dearer, was 2 points lower at 19 per cent. above 1911–13. Eggs were about 3*d*. per dozen cheaper on average and the index number declined by 6 points to only 17 per cent. above pre-war. A year ago eggs were 51 per cent. dearer than in February, 1911–13. The combined index figure for poultry was 3 points lower on the month at 44 per cent. above the base period, lower indices being recorded for fowls and geese.

Other Commodities.—The upward movement in potato prices continued during February, a rise of about 3*s*. per ton being recorded, and the index was 2 points higher at 73 per cent. above 1911–13. Hay was slightly cheaper and the combined index number was 2 points lower at 10 per cent. below February, 1911–13. Wool also declined further and was 25 per cent. cheaper than in the base period. Vegetables generally were a little cheaper, prices on average being 40 per cent. above pre-war as compared with 45 per cent. in January.

Index numbers of different commodities during recent months and in February, 1929 and 1930, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930			1931	
	Feb.	Feb.	Nov.	Dec.	Jan.	Feb.
Wheat	31	21	—11*	—17*	—24*	—31*
Barley	28	Nil.	11	Nil	3	3
Oats..	36	—8*	—17*	—20*	—16*	—18*
Fat cattle	34	37	28	20	27	25
,, sheep	56	56	53	44	50	37
Bacon pigs	50	95	29	26	34	31
Pork ,, ...	60	99	50	53	57	51
Dairy cows..	33	31	31	30	33	32
Store cattle..	23	26	23	22	28	29
Store sheep..	57	49	56	50	48	35
Store pigs	56	135	111	104	114	98
Eggs	68	51	33	14	23	17
Poultry	41	41	36	31	47	44
Milk	70	67	57	65	62	62
Butter	53	43	10	12	14	16
Cheese	74	39	16	16	21	19
Potatoes	29	—14*	46	49	71	73
Hay	4	34	—7*	—7*	—8*	—10*
Wool	69	18	—17*	—19*	—22*	—25*

* Decrease.

Farm Workers' Minimum Wages.—A Meeting of the Agricultural Wages Board was held on March 17, 1931, at 7 Whitehall Place, London, S.W. 1.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders carrying into effect the Committees' decisions.

Durham.—An Order to come into operation on May 14, 1931 (when the existing rates are due to expire) and to continue in force until May 13, 1932. The minimum rates in the case of male workers of 21 years of age and over are: for horsemen who are householders, 32*s.* per week of 50 hours with, in addition, 7*s.* per week to cover all time customarily spent in attention to horses; for horsemen who are not householders and who are not boarded and lodged, 31*s.* per week of 50 hours with, in addition, 3*s.* 6*d.* per week to cover all time customarily spent in attention to horses; for horsemen who are boarded and lodged, 31*s.* per week of 50 hours and any additional time customarily spent in attention to horses. For stockmen or shepherds who are householders the minimum rate is 43*s.* per week; for stockmen or shepherds who are not householders and who are not boarded and lodged, 36*s.* 10½*d.* per week, and for stockmen or shepherds who are boarded and lodged, 35*s.* per week, in each case for such hours as are customarily spent in attention to stock. The minimum rate for other male workers of 21 years of age and over is 31*s.* per week of 50 hours.

except in the case of casual workers, where the rate is 6*d.* per hour. The overtime rate for all classes of male workers (other than casual workers) is 10*d.* per hour on Sunday, Christmas Day and Good Friday and after 12 noon on Saturday, and 9*d.* per hour for all other overtime employment. In the case of female workers of 18 years of age and over, the minimum rate is 2*s.* 6*d.* per day of 8 hours with overtime at 4*d.* per hour.

Essex.—An Order continuing the operation of the existing minimum and overtime rates of wages from April 5, 1931, when the existing rates are due to expire, until March 26, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 41½ hours in the weeks in which Easter Monday and Whit-Monday fall; 50 hours in any other week in summer; 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with overtime at 9*d.* per hour on weekdays (including Easter Monday and Whit-Monday) and 10d. per hour on Sundays and on Christmas Day. The minimum rate in the case of female workers of 21 years of age and over is 5½*d.* per hour for all time worked.

Northumberland.—An Order to come into operation at noon on May 13, 1931 (when the existing rates are due to expire), and to continue in force until noon on May 13, 1932. The minimum rates in the case of male workers of 21 years of age and over are: for stewards, horsemen, cattlemen, stockmen and shepherds hired by the week or longer period, 39*s.* in the case of householders and 36*s.* in the case of workers who are not householders, these rates being payable in respect of a week of customary hours not exceeding 62. In the case of other male workers (except casual workers) of 21 years of age and over the minimum rate is 32*s.* per week of 52½ hours in summer and 48 hours in winter. In the case of casual workers of 18 years of age and over the minimum rate is 7½*d.* per hour. The overtime rates for all classes of male workers other than casual workers are one and a quarter times the general minimum time rate on weekdays and one and a half times the general minimum time rate on Sundays. In the case of female workers of 18 years of age and over the minimum rates are 5*d.* per hour except for casual workers, the rate for whom is 3*d.* per hour, overtime being payable in each case at 1*d.* per hour more than the general minimum time rate.

Sussex.—An Order continuing the operation of the existing minimum and overtime rates of wages from March 30, 1931 (*i.e.*, the day following that on which the existing rates are due to expire), until March 20, 1932. The minimum rate in the case of horsemen, stockmen, cowmen and shepherds of 21 years of age and over is 36*s.* per week of 50 hours in the weeks in which Good Friday, Whit-Monday and Christmas Day fall and 58 hours in any other week. The minimum rate in the case of other classes of male workers of a similar age is 31*s.* per week of 44 hours in the weeks in which Good Friday and Whit-Monday fall; 52 hours in any other week in summer; 40 hours in the week in which Christmas Day falls and 48 hours in any other week in winter, the overtime rates being 9*d.* per hour on weekdays and 10½*d.* per hour on Sundays in the case of all classes of male workers. The minimum rate for female workers of 18 years of age and over is 5*d.* per hour with overtime at 6½*d.* per hour on weekdays and 7½*d.* per hour on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

Enforcement of Minimum Rates of Wages.—During the month ending March 14, legal proceedings were instituted against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines			Costs			Arrears of wages			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Durham ..	Durham ..		*		3	13	6	32	10	6	1
Gloucester ..	Moreton-in-Marsh	2	0	0		—		28	10	0	2
Salop	Bridgnorth	0	1	0	0	5	0	11	17	6	1
Salop	Much Wenlock	2	0	0	1	15	0	17	0	0	1
Cardigan ..	Aberayron ..	1	0	0		—		8	17	6	1
Carmarthen	Llangadock		†			—			—		1
Denbigh and Flint.	Overton-on-Dee.	1	0	0	0	6	0	30	0	0	1
		£6	1	0	£5	19	6	£128	15	6	8

* Dismissed under Probation of Offenders Act.
† Case dismissed.

* * * * * *

Foot-and-Mouth Disease.—Two further outbreaks of foot-and-mouth disease have been confirmed in Great Britain. The first occurred in the borough of Stafford on March 8, and the second at Menston, near Leeds, on March 14. In each case the usual restrictions were imposed upon an area having a radius of approximately 15 miles round the infected premises.

* * * * * *

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Devonshire: Miss U. A. Ridgway, N.D.D., B.D.F.D., has been appointed Assistant Instructress in Dairying, *vice* Miss A. A. Shearman, N.D.D.

Oxfordshire : Miss D. V. S. Lamb, N.D.D., has been appointed Assistant Instructress in Dairying and Poultry Keeping, *vice* Miss B. C. Beamond, N.D.D., B.D.F.D.

Wiltshire : Mr. J. O'H. Letts has been appointed Manager of the County Egg-laying Trials, *vice* Mr. W. Saint.

PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

Department of Agriculture, Armstrong College, Newcastle-on-Tyne

Professor J. A. Hanley, A.R.C.Sc., Ph.D., has taken up his duties as Principal of the Department, *vice* Mr. C. Heigham, M.A., resigned.

Royal Agricultural College, Cirencester

Mr. R. Boutflour, M.Sc., has been appointed Principal of the College, *vice* Professor J. A. Hanley, appointed Principal of the Department of Agriculture, Armstrong College.

Midland Agricultural College, Sutton Bonington

Miss K. Cragg, B.D.F.D., has been appointed Second Assistant Dairy Instructress, *vice* Miss D. V. S. Lamb, N.D.D., who has obtained an appointment in Oxfordshire, as notified above.

* * * * * *

NOTICES OF BOOKS

The Land Drainage Act, 1930. By Alban Dobson, C.B.E., and Hubert Hull. Pp. xxiii+154. (London: Humphrey Milford, Oxford University Press. 1931. Price 14*s.* net.)

The Act of Parliament which forms the subject of this monograph replaces legislative enactments extending over four centuries. Following the Statute of Sewers passed in 1531, various measures were introduced at intervals until 1708, when the Commissions of Sewers Act became law. The Acts of 1833, 1841, 1847, 1849 and finally the Land Drainage Acts of 1861 and 1918, provided the basis for subsequent administration. A Royal Commission was appointed on March 26, 1927, under the chairmanship of Lord Bledisloe, then Parliamentary Secretary to the Ministry of Agriculture and Fisheries, to review existing legislation. With unusual expedition, the Commission reported on December 5 of the same year, its recommendations being embodied in the Land Drainage Act, 1930. The present volume contains a comprehensive account of this measure, the text of which is printed in full with useful annotations. There are lists of relevant statutes and cases, appendixes giving statutory rules and orders and an interesting historical introduction. A book of this character carries its own commendation, but the fact that one of its authors is an official of the Ministry does not, of course, commit the Department to the views expressed therein.

* * * * * *

Farm Weeds. *Unkräuter im Ackerbau der Neuzeit.* By Emil Korsmo, Translated into German from the Norwegian by Dr. H. W. Wollenweber. Pp. x + 580, with 470 illustrations. (Berlin: Julius Springer, 1930. Price 66 RM.; bound 69.60 RM.)

Korsmo's work long since made him an authority on the important subject of farm weeds, and his big volume *Ugress i nutidens Jordbruk*, published in 1925, added to his international reputation as an able and careful investigator. A condensed form of his book appeared in 1926 as part of a large Swedish handbook of agriculture. To many who have no knowledge of Scandinavian languages, this German translation will prove most valuable, the more so because it has been revised in the light of the latest information, and 44 species that are more widely distributed and of greater economic importance in Germany than in Norway have been added. Further, the German work is even more copiously illustrated than the original. In all, it deals with 209 species of weeds. In the main, the volume covers the results of investigations and experiments carried out by Korsmo for some 35 years, and indicates also an extensive examination of the literature of the subject. It deals with the various types of weeds, the damage they do, their distribution, the prolific occurrence of weed seeds in the soil, the different species of weeds, preventive and remedial measures, and experimental results. As an indication of the methods adopted by Korsmo it may be stated that, in order to determine the incidence of weed species, he conducted tests in which he removed plots of soil 1 sq.m. in area and 25 cm. deep, distributed the soil over a much larger area of sterile sand, and counted the seedlings that appeared—also identifying them. By this means he ascertained that the farm soils concerned contained weed seeds to the extent of many millions per acre.

The illustrations in this volume are thoroughly good, clear and well produced, and the print is excellent: altogether a very reliable and attractive work, the transformation into German having been very creditably done.

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NOTES FOR THE MONTH

Sheep-Breeding Conference

"THE Place of Sheep in Modern Farming" formed the subject of a well-attended Conference at Rothamsted on March 24. Mr. J. Egerton Quested, Chairman of the Farmers' Club, and one of the best known sheep-breeders in this country, occupied the chair, and the speakers included sheep-farmers from Scotland and from the principal sheep districts of England.

The papers were mainly descriptive of individual experience and, as was to be expected, revealed a growing preference for the grazing sheep. It soon became clear that no single breed is equally well suited to all conditions and all circumstances. In the north, for the better classes of grass land, the Half-bred (Border Leicester X Cheviot) is prime favourite; the Greyface or Mule and the Masham are preferred where sheep have to work harder for a living; and the Cheviot and Blackface for the still scantier fare of "rough grazings" and moorland.

The Half-bred has spread southwards to the Midlands, where it is already very popular and has even invaded Kent—hitherto the stronghold of the Kent or Romney Marsh breed. The Romney Marsh district, however, is still mainly, if not entirely, stocked with the famous sheep of the county, and it is doubtful whether any other breed would continue to thrive equally well on this productive, if somewhat bleak and winter-sodden stretch of country. As many as 10 ewes and their lambs per acre are carried through the summer entirely on grass, and little trouble is experienced from the commoner sheep ailments. The old saying that a sheep's worst enemy is another sheep seems to apply with less force to the Romney Marsh than to most other breeds. The chief fault of the breed is that it is not very prolific.

Westwards the Half-bred competes with the Kerry Hill and Exmoor Horn, while in the fertile pastures of Somerset the Dorset Down still holds undisputed sway. Other breeds,

formerly confined mainly to arable land, such as the Suffolk, Hampshire and South Down, have recently in some cases been converted to grass sheep. Sheep-folding is still, of necessity, practised by breeders of Down rams in connexion with the ram lamb trade, and the future of pure-bred flocks is assured if only because pure-bred rams are needed for the continued existence of crossing flocks.

The same diversity of practice obtains with regard to the use of rams for crossing. A very popular store with graziers is the progeny of the Romney Marsh ewe and the South Down ram, the cross that provides the well-known "Canterbury Lamb," but more and more farmers are aiming at the production of fat lamb and, in normal circumstances, the Half-bred ewe crossed by a Down ram, *e.g.*, Hampshire or Suffolk, is favoured for this purpose. Besides being more prolific, she is a rather better nurse than the Romney Marsh. The South Down ram, also, is used on Half-bred and other smaller types of grass ewes. The lambs of this cross are of excellent quality and are much sought after by butchers, but a slightly higher price per lb. does not usually compensate for a lighter carcass weight.

As a result of an ever-growing demand for Half-bred ewes prices in recent years have soared, and many farmers have been experimenting with the lower-priced hill breeds, on which depreciation tends to be less. There is the sanguine individual, to whom the most expensive thing is cheapest in the long run, but, unfortunately, his run, generally, is not long enough to prove his system. After all, 100*s*. or 110*s*. for a ewe to lamb in March is rather like paying £50 or £60 for a tuberculin-tested cow and selling her milk at 1*s*. a gallon! The majority of the Half-bred ewes coming into England from the Border breeding-grounds are draft ewes that have already produced three or four crops of lambs. When sold fat after a further crop of lambs, perhaps in mid-summer when ewe mutton is a drug on the market, the depreciation may amount to 30*s*. or more per head. To counteract this, farmers with a sufficient command of capital maintain their flocks by buying, annually, gimmer or two-teeth ewes sufficient in number to replace the old ewes drafted, or they may obtain an annual consignment of ewe lambs. Few farmers in England have yet attempted to cut out carriage and depreciation by producing their own Half-bred ewes. Unfortunately this project would mean the keeping of two breeds—Cheviots and Half-breds, and periodical renewals of the Cheviot flock. There

is, of course, a possible alternative—breeding Half-bred to Half-bred, a practice which to some extent obtains in Scotland. Further information as to the value of the sheep thus bred would be of great interest to English farmers.

There is a certain amount of risk that the production of summer lamb may soon be overdone. One speaker referred to the possibility of cold storage whereby a summer surplus might be carried forward for release in the winter months. Pending this development farmers would do well to consider the possibility of more out-of-season breeding. Dorset Horns can be got to lamb in September when there is normally an abundance of good grass in the south. Dorset Downs, the breed which, according to its whimsical protagonist, "possesses all the good qualities of the Hampshire and Southdown, and none of their defects," will lamb in November and December and produce lambs (as well as fat draft ewes) saleable about Easter when prices, generally, are relatively high. Hampshires and Suffolks and crosses of rams of these breeds, and of the Dorset Horn Ram, with Half-bred ewes will produce lambs in January and February, while Half-bred ewes themselves, especially the older ones, can be got to lamb in late January and in February.

Winter-breeding of this kind will involve greater attention to pastures—manurial treatment, where necessary, for maximum production in the last months of the year and judicious management of suitable fields, such as new leys or winter-green permanent pastures, for the production of early spring keep. Even so, it will be necessary to help out such winter keep by scattering kale and mangolds on the pastures and providing an allowance of hay. If the hay is distributed in single handfuls or tufts there will be practically no waste. All such provision probably entails less labour and expense, and less discomfort to sheep in wet weather, than folding; and on dry land in the south, naturally sheltered, or giving access to an open shed or Dutch barn, winter lambing can usually be undertaken without the provision of special lambing-pens.

Figures produced clearly indicated that twins were more profitable than singles. "Flushing," as is well-known, tends to the production of twins, and sainfoin and rape were favourably mentioned in this connexion. Draft ewes brought south almost invariably produce a large proportion of twins, but if retained for another year the percentage commonly falls. Moreover, the percentage from old ewes in the south, originally purchased as gimmers, seems seldom to reach the high figures obtainable from draft ewes brought direct from Scotland. Why this

should be so is difficult to explain. Perhaps "buying the best," in other words the "tops," has something to do with it. The tops or first cuts will usually consist for the most part of single lambs: later cuts will contain more twins. It would be interesting to compare "the best" with the "second best" in respect of twinning.

Finally, with regard to disease, a strong case was made for research into such common troubles as foot-rot, "fly," intestinal worms and "pulpy kidney." In view of the national importance of sheep, "the backbone of the farming industry," it was hoped that this plea would receive attention.

This Conference was a useful meeting, conveying many lessons of which not the least important was, perhaps, the need for a wider background of knowledge to set against the confident deliveries of this or that specialist.

* * * * * *

The following note on the papers read at the conference has been communicated by Mr. H. V. Garner, M.A., B.Sc., of the Rothamsted Experimental Station:—

As on previous occasions, most of the papers were read by farmers representing the best practice of their respective districts, and an excellent picture was obtained of modern sheep management under a wide range of conditions.

In the course of his opening remarks the Chairman dealt with the system of management of his well-known flock of Romney Marsh sheep in their native district. The main object is the export of pedigree animals, but the other avenues of disposal of the breed were discussed. Pedigree breeding in arable land was described by Mr. John Joyce of Milverton, Somerset, and Major V. S. Bland, of Marlborough, the former describing the management of his flock of Dorset Horn, and the latter of his Hampshire Downs. As these speakers set out their programme of cropping one could not fail to be struck with the care and resource required to provide fresh, nutritive and palatable keep from the arable land at the correct season. Their systems are intensive and costly in labour, but maintain the land in high condition, so that the returns would be appreciably increased when more normal prices for cash crops are obtainable. Specialized as this type of management is, it has much in common with the production of early fat lambs on arable land; for these there is a market not yet upset by overseas supplies.

Still keeping to sheep maintained for the most part on ploughed land, Mr. Drewitt, Colworth, Sussex, spoke of the

management of his Southdown flock with a view to reduction of costs to meet present circumstances. Labour could be saved by substituting kales or cross-harrowed turnips for swedes; and breeding from ewe lambs was sound provided that extra food and care were given.

It was, however, the day of the grass sheep, which were regarded by most of those present as the leading class of stock for converting into a saleable form the produce of the large acreage of new grass laid down since the war. Mr. F. A. Thomson, Livestock Inspector of the Scottish Department of Agriculture, showed how the Blackface and Cheviot ewes, when put to the Border Leicester Ram, produced a suitable type of animal for the above purpose. He dealt with the respective qualities of the two crosses, the Greyface and Half-bred, and with the production of fat grass lamb when these crosses in their turn were put to the Suffolk or Oxford ram. Mr. J. R. Wood followed with an interesting account of the building up and management of a Half-bred flock on the Scottish borders.

Turning now to the destination of the north country crosses, Mr. A. C. Hill, Hatfield, Herts, gave his experience with several classes of crossbred grass sheep—Greyfaces, Half-breds and Mashams (Wensleydale ram on Blackfaced ewe). Skilful grass management and ceaseless vigilance against pests and disease were the essentials of success with grass sheep. The Southdown Ram on the Half-bred produced excellent quality small lamb, but the extra quality did not compensate for the loss of weight as compared with the progeny of a Suffolk or Hampshire ram. Mr. Henry Edgar then dealt with the Half-bred as a grass sheep on the hill land in Hampshire, and made out a very strong case for this type. He bought in ewe lambs for breeding, and insisted on the need for good treatment. The part played by grassland sheep in Norfolk was set out by Mr. Alfred Lewis, of King's Lynn. The "First Cross" (Cotswold ram on the Suffolk ewe) and the Masham were used. He indicated the move that had taken place towards early maturity and how this had been met.

The general aspects of sheep husbandry in relation to present-day conditions were discussed by Mr. Miller, Director of the Rothamsted Farm. He gave an interesting analysis of the situation of prices and supplies and concluded that a heavy fall in store prices next autumn was probable. To maintain our position in the home market it was essential to study the consumers' requirements and produce the high quality small carcass that was wanted. He agreed that the mountain and

hill crosses were the most profitable sheep for the ewe flock at grass, but pointed out that there were a great many questions in connexion with this branch of farming which had not yet been satisfactorily answered. Mr. Miller also mentioned a number of other problems of feeding, management, and disease which deserved scientific examination. This paper linked up naturally with the remarks of Mr. J. F. H. Thomas, Cirencester, who described a scheme of inquiry approved by the Experimental Committee of the Bath and West Society, designed to collect information from flock masters in the south-western counties with regard to their special problems. When the large body of information had been sifted a considered attack on certain of the more important problems would be made.

Experience at Wye College with various breeds and crosses of hill sheep was communicated by Mr. H. V. Hewison. The key to satisfactory returns was the prolificacy of the ewe.

Mr. J. Hunter Smith, Herts Institute of Agriculture, also described similar work. Having tested Ryeland, Kerry Hill and Half-bred ewes for lambing performance it was decided to restrict further work to the Half-bred. On crossing this with the Southdown and the Suffolk it was found that the former produced the earlier maturing lambs.

One feature of the papers was the eagerness with which farmers were looking to scientific men for the solution of some of their troubles in sheep husbandry. Foot rot, sheep sick pastures, internal parasites, "stale keep," and increased prolificacy were all subjects in which it was recognized that in scientific study lay the only hope of a rational attack.

* * * * * *

Good Silage versus Bad Hay

THE following note has been communicated by Mr. A. W. Oldershaw, B.Sc., Agricultural Organizer for East Suffolk:—

There is good reason to suppose that quite one-third of the hay made in Great Britain in 1930 was seriously damaged by bad weather, and of this, a large proportion was completely spoilt. The climate of Great Britain is notoriously uncertain and it is surprising that ensilage is not more extensively practised. The damage to last year's hay crop by adverse weather raises the question whether British farmers are well advised in attempting to make hay in a really wet season. In quite a large proportion of seasons, especially in districts of heavy rainfall, a second crop of clover is difficult to get into really good condition for hay.

Particulars regarding ensilage are given in the Ministry's Miscellaneous Publications No. 53,* and it is not proposed here to deal with the details given therein. It may be mentioned, however, that modern ensilage practice has largely involved the growing of special crops for silage. These have, in many cases, been ensiled in tower silos of various types. These silos are expensive to erect, and special cutters and blowers usually have to be provided to fill them. Very good silage can, however, be made without the erection of a costly silo. Ordinary meadow grass is easier to make into silage by simple and inexpensive means than are special crops, which include such plants as oats, tares, peas, beans, sunflowers, or maize.

The important points in making silage are to keep air and water from gaining access to the material, and to prevent it from getting dry. The special crops above referred to are "open" in texture and easily admit air and water, whereas meadow grass "goes together" very closely and neither air nor water easily gains an entrance when it is heaped up in mass. Probably most of the damage associated with the entrance of air is caused by partial drying and resulting mould.

Of methods of making silage without an expensive silo, the simplest and best known are :—

(1) *Stack Silage.* This is especially suitable for meadow grass. When "open" materials such as oats, tares, peas, beans, maize, etc, are made into stack silage, air gains access at the sides and a variable but rather considerable amount of waste may occur. Whatever the material used, a stack with a circular base is to be preferred, as it has less exterior and no corners. A stack with an oblong base may, however, be used. With such a stack there is apt to be more waste at the corners, but less labour is involved in moving the heavy grass during erection than with a stack with a circular base. The green material should be carted as soon as cut.

The stack should be carried up as high as possible and well trampled, especially round the outsides. Occasionally a pony is used for trampling. A steep roof should be made, as it will settle considerably and tends to become flatter than was intended. This may be covered up by sand or earth.

Some, however, prefer to top up with inferior grass and hedgeside stuff and to put on no further covering. It is important that the roof should be carefully made so that

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 1*s*., post free 1*s*. 2*d*.

the surface is a regular slope and no hollows are left where rain water will "pipe" into the stack.

Stack silage has been made of meadow grass by various farmers known to the writer, and when suitable precautions, such as those given above, have been taken, excellent material has resulted. During the late summer of 1930, when the weather gave no indication of improving and hay-making was hopeless, excellent stack silage was made in this way on farms under his observation.

(2) *Clamp Silage.* This is suitable for meadow grass, clover and sugar-beet tops. Air gains access when "open" materials are made into silage by this method. The clamp, made very much on the lines of a long manure heap, 12 or 14 ft. wide, on the surface of the ground, is taken as high as possible, carted over, and then earthed up. Details of making sugar-beet top silage by this method were given in the issue of this JOURNAL for October, 1929, p. 634.

Sugar-beet-top silage made in this way does not suffer from drying on the sides so much as might be expected, probably because it is made in late autumn and winter when there is very little drying, and because it is, as a rule, used up before summer.

(3) *Trench or Shallow Pit Silage.* This is suitable for meadow grass and also for more "open" materials containing oats, tares, peas, beans, lucerne, sainfoin, red clover, etc.

By laying the stalks of maize lengthways in the pit it is even possible to make excellent silage from unchaffed maize by this method. The stalks must not cross each other, however, or the material will not go close enough together.

This method has been previously described by the writer* It may be mentioned, however, that excellent silage has been made by the adoption of the following procedure :—

A shallow pit 12 to 15 ft. wide and 4 ft. or so deep is dug. The length will vary according to the amount of material to be ensiled. A good depth is an advantage provided there is no trouble from water. Drainage is necessary on heavy soils, a pipe being put in the floor of the pit and arranged to conduct the water to the nearest ditch. If the site of the pit is carefully selected, it may be used for many years. The green stuff should be cut, if possible, fairly dry, and when a few days more mature than would be considered desirable for hay. Cart at once, or after wilting not more than 24 hours, and before the material is at all dry. After two days' carting,

* This JOURNAL, July, 1919; April, 1920; February, 1921. *Journ. Bath and West*, 1918-19. *Scot. Journ. of Agric.*, April, 1924.

a day may be missed to allow for settling, when carting may usefully be continued. The material should be trampled and consolidated as much as possible, especially round the outsides, the empty cart being taken over the heap. A horse or pony is useful for trampling.

The heap should be taken as high as possible above the surface of the ground, and a very steep roof made. The last few loads of material may be of rakings or inferior stuff.

The heap should be covered with from 6 in. to 8 in. of earth or sand as soon as finished. Considerable settling takes place and the roof should be looked over after a few days and cracks filled in. Elbows, forming at the eaves, should be removed, or water will gain access. After a time, the roof may, if desired, be covered with sheets of galvanized iron to keep rainwater out. If the roof can be kept at a good slant very little water will enter, but if hollows are allowed to form, it will soak in and cause the material to rot.

The chief causes of failure in making silage by this method are :—

(1) The crop is placed in the silo too wet or too dry.
(2) Insufficient consolidation, especially round the outsides.
(3) An imperfect roof, with insufficient slope, which allows rainwater to enter the silage and rot it.
(4) On heavy soil an accumulation of water in the partly emptied trench, owing to drainage not being provided.

* * * * *

The 1930 Sugar-Beet Crop in England and Wales

PRELIMINARY returns of the 1930-31 beet-sugar manufacturing season in England and Wales are now available. The area of 347,257 acres under sugar-beet was the highest yet recorded in the history of the industry, and showed an increase of 117,339 acres or 51 per cent. over the area in the previous year. This increase is to be attributed in part to the good results obtained in 1929, but an influencing factor also was, no doubt, the generally poor prices prevailing for other farm crops.

The weather was not, on the whole, favourable to the crop. Excessive rainfall prevented the preparation of satisfactory seed beds, while cold and wet conditions in spring not only delayed seeding but retarded germination and growth in the early stages. Subsequently the weather improved somewhat, but from the middle of June onwards rain fell incessantly in most districts, with the result that when lifting commenced in late September the crop, except on the highlands and lighter soils, which had benefited rather than otherwise from the excessive moisture, was in a backward state. The sugar

content was noticeably poor, the first weeks' deliveries averaging 15·6 per cent. only, whereas the corresponding figure for 1929 was 18·9 per cent. Although during October the ideal combination of bright days and cool nights caused the sugar content to rise rapidly, the average of 16·7 per cent. for the season was a full one per cent. lower than that for 1929, and also inferior to the 17·4 per cent. obtained in 1928. The yield of 8·8 tons of topped and washed beets per acre also exceeded the early expectations, and while still low as compared with Continental standards, was the highest yet attained in this country. The total quantity of beets delivered to the factories in 1930 was about 3,042,000 tons, or over one million tons more than in 1929. The reduction in sugar content previously noted was reflected in the lower beet prices, which averaged 49*s*. 10*d*. as against 52*s*. 11*d*. and 51*s*. 11*d*. respectively in 1929 and 1928. The reduced sugar content was also responsible for a reduction in the yield of commercial sugar per acre, which on the production of 8,450,000 cwt. of sugar averaged approximately 2,720 lb., or about one cwt. per acre less than in 1929. The tare, which rose considerably as a result of the adverse climatic conditions from November onwards, was higher than usual, being 14·8 lb. per cwt. of beet as against 13·4 lb. and 14·5 lb. respectively in 1929 and 1928. The quantity of dried pulp produced was about 195,000 tons, of which 117,000 was plain and 78,000 tons molassed. About 6 per cent. of the dried pulp was exported. The production of wet pulp was about 35,000 tons.

A feature of the season 1930 was the unusually large scale on which clamping was resorted to, upwards of 35,000 tons of beet being conserved for one factory alone by this means. It was reported that when clamped in good condition the roots showed little appreciable loss either in weight or sugar content when the clamps were opened up, and, when for any reason delivery to the factory could not be made until after the end of November, it was preferable in 1930 to lift and store the roots rather than to leave them in the ground.

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Bedfordshire Egg-Laying Trials, 1929-30

AN interesting Report of the Bedfordshire Egg-Laying Trials, 1929-30, has recently been issued. The organizers of the trials are to be congratulated on this example of effective co-operation with a National Mark Packing Station, to which the eggs from the trials were sent.

Producers will be interested to observe the high percentage of Specials and Standards produced during

the trials. This was particularly noticeable during the six months, April to September, when these two grades comprised 76 per cent. of the total number of eggs sent to the packing station.

The average prices secured by the packing station for eggs of the various grades were as follows :—

Grade	6 *Winter months* Oct.-Mar. per doz.	6 *Summer months* Apl.-Sept. per doz.
	s. d.	*s. d.*
Special weight (2¼ oz. egg) ..	2 5	1 9
Standard weight (2 oz. egg)..	2 2¾	1 7
Medium weight (1¾ oz. egg) (formerly Pullet standard)	1 11	1 4½
Small and faulty	1 6½	1 1½

The testing for faults at the Station showed the following results :—

Period	*Total No. of eggs*	*Blood spots*	*Meat spots*	*Watery whites*	*Stale or shakers*	*Total No. of faulty eggs*
Oct.-Mar.						
Number ..	13,613	57	12	9	1	79
Per cent. of total ..	—	0·41	0·09	0·07	0·01	0·58
April-Sept.						
Number ..	14,125	174	23	95	159	451
Per cent. of total ..	—	1·24	0·16	0·67	1·13	3·20

It will be seen that the number of faulty eggs in the summer months was fully five times as great as during the winter months.

It was found that, while a number of hens laid an occasional egg containing a blood spot, 71 of the blood-spotted eggs, *i.e.*, more than one-third of the total, were laid by four hens only out of the 150 hens concerned in the trials. About one-third of the hens laid eggs with watery whites, but the above figures indicate that the percentage of watery whites produced in the winter period was only 0·07 per cent. of the total supplies and in the summer period 0·67 per cent.

The information so obtained indicates the value of a National Mark Egg Packing Station to producers in drawing attention to quality points and in enabling producers to trace stock producing defective eggs. This is a matter of special interest to breeders, but it also has a definite bearing upon the marketing problem, in view of the vital necessity of ensuring that first-quality eggs only are placed on the market in competition with imported supplies.

THE USE OF ELECTRICITY IN HORTICULTURE

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THE application of electricity to agriculture is hampered by the scattered nature of the premises to be supplied, and by the irregular nature of the demand, which is in direct contradiction to urban industrial conditions. Market gardening, however, is carried out on more intensive lines and in more concentrated areas than is usual in farming proper. In addition, the intrinsic value of the crops produced is comparatively high, and control of the time of fruition is very important. The market-garden areas, too, are often on the fringe of some urban or industrial area that renders easier the supply of electricity.

This article is a survey of the main applications of electricity to horticultural and allied work. These are considered under three heads :—

(1) Power for cultivation.
(2) Heat in its application to the stimulation and control of growth.
(3) Light in its application to the stimulation and control of growth.

It has not been thought necessary to mention the applications of electricity to supply power for pumping and simple machinery work or to provide domestic and general lighting and heating ; these are sufficiently straightforward and simple to be self-evident. Nor is much to be said of electro-culture. This subject is being studied by a special committee, and the Ministry has recently issued a notice explaining that, while the investigations carried out under the ægis of that committee have shown that an increased yield can be produced by the application of an electric discharge to cereals, to which crop attention has been mainly directed, the process is not economic.

(1) Power for Cultivation.—The same technical problems are met with in the application of power to horticultural cultivation as in the application of power to large-scale cultivation. In market-garden practice, however, the size of the plots is often too small to allow a tractor to be used. This reduces the effective alternatives to hand-labour, horse-traction and special, small implements such as rotary tillers.

The small, three or four horse-power rotary tiller offers the simplest problem in electrical application. The power is

applied directly to the rotating tines and the question of traction is eliminated; the light electric cable offers none of the manœuvring difficulties presented by the bigger electric tractors. An electrically-propelled rotary tiller for hand control has been produced for some years by Siemens-Schuckert in Germany.

The rotary tiller, however, involves principles of tillage which are by no means generally accepted as being better than the more usual methods of digging and ploughing. It is to the last system, therefore, that the most recent attempts to apply electrical power have been devoted.

The most up-to-date developments in this direction have taken place in France. The author has seen the Petit Treuil de Labourage Electrique S.G.A.—light-weight electrically-operated ploughing set—working on a market garden near Paris. This is made by the Société Générale Agricole. It is a cable ploughing outfit working on the single-winder principle, and consists of a winder unit, an anchor unit and a steel cable to which the plough or other implement is attached. The winder unit and anchor unit are each mounted on a four-wheeled bogie which runs on narrow-gauge rails. The set is intended for use in market gardens where the plots are bounded and intersected by narrow-gauge railway tracks, which facilitate the transport of heavy loads The anchor unit and winder unit are placed in position on rails at the opposite end of the plot to be worked. The winder unit is fitted with a 5 h.p. motor and starting gear, and clutches for reversing the winding-drum; a pump is fitted and can be driven by the motor when required. The anchor unit is fitted with a horizontal pulley and a tank which is filled with water to provide ballast. The outfit pulls a single-furrow balance plough or any other implement that may be fitted.

One man to work the electrical controls and another man or boy to guide the plough are sufficient. The rate of working depends on the length of furrow—usually from 25 yards to 30 yards long—and varies from one-third to three-quarters of an acre per day. This is, of course, not to be compared with tractor work, but with spade digging. The machine worked satisfactorily and there was no technical hitch. The price was quoted as £244, at which figure there is no evidence that it can be used with economic advantage. If such an outfit could be produced at a much lower cost, further steps might be taken to determine whether it could be worked economically on market gardens.

The Electro-Jardinier Rigondeau* is another light-weight cultivating set produced in France. This is a single winder, working only in one direction, but providing a simple unit that can be worked by one man. No figures about cost or performance appear to have been published.

The Rigondeau machine with its single winder would be suitable for small orchard work; the machine presents no difficulty in moving from row to row, since at the end of each bout the wire and implement are wound into the body of the machine, which can be moved along in one piece. This practice is similar to that used in the German vineyards, where, however, engines are used instead of electric motors.

(2) Heat for the Stimulation and Control of Growth.—The most straightforward application of electricity for heating is to substitute electric heaters for the coal or oil furnace of the ordinary hot-water greenhouse installation. Worked out from heat units and electrical units the cost of the electrical working is prohibitively high, and might be dismissed without the trouble of experiment. At the same time it is interesting to note that a nurseryman at Lyons has equipped a glasshouse installation with an electric heater in place of the original coal furnace and has given the whole system a good trial. The electrical heater was a simple immersion unit, and the comparative capital costs for coal and electric heater were £28 and £25 respectively. The general convenience of the electrical system, saving of coal storage room and transport, stoker's wages, etc., made the scheme economic up to a cost of rather less than one halfpenny per unit for electricity. British coal, however, has a higher calorific value than that used during the experiment, and taking everything into account the application would not show economic success in this country.

In fact, any suggestion for supplying electrically the whole, or general, heating required by a greenhouse is impracticable at present owing to the lower cost of the coal-cum-water system. In glasshouses in which the plants are planted in the ground, and not in boxes or pots, however, the ordinary method of heating the house warms the soil but slowly. Electricity offers an easy method of applying extra heat underground and so to accelerate early root development, and may enable a putting forward of the time of planting and hasten development of the crop. This soil heating is done

* "Electro-Jardinier Rigondeau": *Implement and Machinery Review*, March, 1930, p. 1144.

by means of cables buried in the soil. Dr. W. F. Bewley has been experimenting on these lines at Cheshunt, and has achieved very satisfactory results with tomatoes.* Increases in money value per acre varying from £26 to £162 have been recorded. There are several technical points to be cleared up before application on a commercial scale can be achieved. The most important point is the necessity for providing a cable installation that is cheaper and less liable to deterioration and corrosion while in the ground. The former has already been attained by using twisted galvanized wire and by transforming the supply to 14 volts. This has reduced the cost of cables by something over 90 per cent., but the experiment has not been carried far enough to measure crop increase, nor has there been time to measure the deterioration of the cables.

The use of electrical heating cables as an alternative to fermenting manure for providing bottom heat in frames and hotbeds is a similar application to the above. This has received a large amount of attention on the Continent, particularly in Scandinavia and Northern Germany, where the spring is more severe than is usually the case in Great Britain. A heating cable is buried in a layer of sand or ash in the bottom of the frame. The sand—or ash—is then covered with soil and culture is carried on in the usual way. When voltages of the order of 100 or 200 volts are used, the cable must be insulated and, being of small section, protected from mechanical damage. Alternative practice is to use a lower voltage of about 40 volts; this means that the cable section is larger and more robust and requires no mechanical protection. Further, owing to the low voltage, no insulation is required and the bare wire can be laid directly in the ashes or sand. The low-voltage system has been technically successful and might be tried in the case of underground heating of glasshouses and thus eliminate the more expensive and less durable insulated cable.

This use of electricity is particularly important in the neighbourhood of towns and cities where animal manure is difficult to obtain. The other main advantages are the ease of control and the saving of the time that would be required

* "Some Experiments on the Heating of Glasshouse Soil by Electricity." Paper read at the Ninth International Horticultural Congress by Dr. W. F. Bewley, Experimental Research Station, Cheshunt.

to remove and renew manure. German experience* shows the following summarized comparison of costs :—

	Electrical hot-bed	*Manure hot-bed*
Cost of frames and lights	12*s.* sq. metre	12*s.* sq. metre
Electrical apparatus	5*s.* ,,	—
Manuring arrangements	—	4*s.* ,,
First cost of installation	17*s.* ,,	16*s.* ,,
Interest 10 per cent.	1·7 ,,	1·6 ,,
Depreciation :—		
(*a*) Frames and lights 10 per cent.	1·2 ,,	1·2 ,,
(*b*) Electrical apparatus 20 per cent.	1·0 ,,	—
Renewal of manure	—	5·0 ,,
Cost of current for 60 days, 1 kWh/sq. metre per day at 0·72*d.* per kWh	3·60 ,,	
Total running cost	7·50 ,,	7·80 ,,

There is thus a balance in favour of the electrical method ; the rate of 0·72*d.* per unit should be readily obtainable in this country. Where the existing supply is 100 or 200 volts the installing of a 40-volt system means the extra expense of special 200/40 volt transformers. Where a new installation, however, is contemplated and a supply is to be obtained from a high-tension line, the voltage can be transformed straight away to 40 volts.

This application of electricity is not being ignored in this country, although the necessity is hardly so urgent as it is in some Continental districts. The Shropshire, Worcestershire & Staffordshire Electric Power Co. is carrying out some experimental work which will probably be directed to the practical ends of facilitating installation and cutting down running costs. The Dutch are turning to this means of help in their endeavours to capture the earlier markets for market-garden produce.

(3) The Use of Light for Stimulation and Control of Growth.—There is now no question about the effect of artificial light on growing plants. Dr. Bewley and others have found that tomato seedlings and young plants exposed to electric light, in order to extend the "light-day," grew better than the plants under ordinary conditions.

As yet, however, there would appear to be no sound evidence that such treatment can be carried out on an economic basis,

*"Die Elektrische Bodenerwärmung," by Dipl. Ing. Kind. *Die Technik i.d. Landwirtschaft*, Dec., 1929.

which is, after all, the criterion of its application on commercial lines. There are also various technical problems that remain to be solved. For instance, one difficulty is in maintaining a suitable temperature; the heat radiation from the lamps tends to draw the plants upwards, although the account of an installation in Cheshire claims practical success,* low-power lamps being used to avoid excessive heat radiation. No figures are given, so that the value of the evidence is reduced.

Conclusion.—The use of electricity in horticulture is in its infancy, but there appears to be more hope for its development here in this industry than in agriculture. It is difficult to point to any particular lines along which a development of importance to horticulture and the market-gardener will come. Nevertheless, the amount of experimental work being carried out is encouraging, and some of it is bound to lead to successful commercial application.

Electricity to supply bottom heat appears to have the best chance of commercial use; in fact the electric hot-bed is now being used on the Continent. A successful demonstration of the system in this country might lead not merely to the fitting of electrical apparatus to existing frames and hot-beds, but to the expansion of the industry freed from the obvious drawbacks of manure hot-beds.

The use of power for cultivation and the use of electric light for stimulating growth are in a rather different stage of development. Cultivating sets are in existence and work well; they do not appear, as yet, to produce an economic return for the capital cost involved. This is a case for reducing the cost of manufacture. Lighting produces pronounced effects on plant growth; here again there is no evidence that the results justify the expenditure. More experiment is required.

It cannot be too strongly emphasized that the question of the use of electricity in horticulture is not being left to chance or to casual and disconnected development. An organized watch is being kept on all experimental work that is being done. The scientific side (laboratory experiments, etc.), the supply side (the power companies) and the horticultural industry itself are collaborating through their representatives to guide and develop investigation towards definite help for the industry. Such applications as emerge into the commercial stage will certainly be well sponsored.

* "Artificial Light Rays in Glasshouses:" Allan Falconer. *Gardener's Chronicle*, March 29, 1930.

THE IMPERIAL BUREAU OF PLANT GENETICS

[The following articles describe the work of the two branches of the Imperial Bureau of Plant Genetics. One branch is attached to the Plant Breeding Institute, Cambridge University, and is concerned with all crops other than herbage plants, while the other, attached to the Welsh Plant Breeding Station, Aberystwyth, is concerned with herbage plants. These articles continue the series on the work of the Imperial Agricultural Bureaux, of which the first dealt generally with the establishment of the Bureaux, and the subsequent articles with the work of the individual bureaux.]*

(1) BUREAU FOR CROPS OTHER THAN HERBAGE, CAMBRIDGE UNIVERSITY.

P. S. HUDSON, Ph.D.,
Deputy-Director of the Bureau.

THE full working of this branch of the Imperial Bureau of Plant Genetics began in February, 1930, the first three months having been taken up in preliminary organization.

Miss R. M. Tupper-Carey began duties as translator in February, 1930, thus completing the staff of the Bureau, which now consists of the writer as Deputy-Director, Miss R. M. Tupper-Carey, M.Sc., and Miss E. E. Parr, Secretary, with necessary clerical assistance, under the Directorship of Professor Sir R. H. Biffen.

The first activity of the Bureau was to get into touch with workers in all parts of the Empire so as to know what sort of service the new Bureau might most profitably provide for overseas workers. To this end a questionnaire was circulated to all Official Correspondents and a number of other plant breeders in all countries of the Empire. From the replies to this questionnaire a full knowledge was obtained of the problems which each worker had to face, with the amount and nature of the work already done and of that in progress, the general agricultural conditions under which his crops were grown and the sort of information which he desired to receive from the Bureau.

* For previous articles of the series, see *Imperial Agricultural Bureaux* (August, 1929, p. 461); *Imperial Soil Bureau* (January, 1930, p. 925); *Imperial Bureau of Animal Genetics* (March, 1930, p. 1149); *Imperial Bureau of Animal Nutrition* (June, 1930, p. 219); and *Imperial Bureau of Fruit Production* (July, 1930, p. 328).

Suggestions as to the nature of the Bureau's activities were invited, and the policy of the Bureau was largely framed on the material in these replies, the account of individual worker's difficulties and the suggestions that some of them put forward. A valuable insight was gained into the work in progress in the whole Empire, and some account of this will be circulated when more urgent questions have been dealt with and the routine of the Bureau has been definitely established.

It was realized from the start that one of the most useful functions that could be fulfilled was to keep workers overseas, many of whom have no ready access to current genetical publications, especially those in foreign languages, informed of all the recent developments of the science. The staff of the Bureau is capable of dealing with work in German, French, Italian, Spanish, Dutch, Russian and the Scandinavian languages. From the beginning of 1930, therefore, all the periodicals received in the Library of the School of Agriculture passed through the Deputy Director's hands and any papers bearing on plant breeding were indexed. A large number of periodicals received in the University Library and the Botany School and other scientific departments of the University were also included in this scheme and, in order that nothing should be overlooked, it was decided to make periodic visits to the London libraries to consult a number of periodicals not available in Cambridge. The index of genetical literature thus built up will in future years constitute the main material by the aid of which the Bureau will be able to answer inquiries on various subjects.

It seemed desirable to get into direct touch with the more important foreign workers and letters were accordingly written to them. A great number of these workers, amongst whom were many eminent geneticists, such as Professor Dr. Erich von Tschermak (Vienna), Professor Dr. O. Appel (Biologischen Reichsanstalt für Land- und Forstwirtschaft, Berlin-Dahlem) and Dr. Å. Åkerman (Svalöf), cordially replied, giving short indications of the work in which they are at present engaged and sending reprints of their papers. These reprints, together with those received from colonial officers, are filed in the Library and may be sent on loan for short periods to overseas workers who have difficulty in consulting the original journals. It is proposed from time to time to circulate lists of the papers so available.

From the original replies to the questionnaire an index was compiled of the subjects on which various officers desired to be kept informed. This, however, covered such a large field that it was ultimately decided to circulate to all officers abstracts in English of all the current papers received during each half year. A number of requests for such summaries had been received from correspondents and it was deemed one of the most valuable services which the Bureau could fulfil. These abstracts serve to keep correspondents in touch with all the latest developments in plant breeding and the genetics of economic plants in general. At the same time they draw the attention of each worker to the literature on the subject in which he is interested, since they are classified according to subjects, usually according to the crop with which they deal. Correspondents may thus consult the original article for more detailed information, and frequently write to the Bureau for further information on individual papers to which they have no access or which are written in foreign languages.

These abstracts were first issued in typescript, but were received by correspondents with such appreciation that permission was obtained from the Council of the Imperial Agricultural Bureaux to have them printed, and they are now being printed and issued at quarterly intervals. The abstracts are printed in such a way that the titles and reference to the papers can be cut out and pasted on to filing cards of the standard library size. To facilitate the filing of these cards the classification number according to the Universal Decimal System is also included. This is an international system which is used for classifying the index of the Bureau, and a considerable number of correspondents have expressed a desire to be instructed in its use so that they may file the references which they receive from the Bureau on the same system. A memorandum on the use of the Universal Decimal Classification has therefore been drawn up, and those sections of the manual of the Institut International de Bibliographie which have a bearing on plant genetics have been translated from the French for the use of these correspondents. Certain other Imperial Agricultural Bureaux have contributed translations of the sections which concern them. The memorandum has been approved by the Institut International de Bibliographie and is at present in the press.

It was realized that in order to deal with inquiries satisfactorily the index must also contain the literature published

before the Bureau began to function in this way. This being a very large undertaking it was decided to deal with the crops in succession. A start was made with wheat, the literature of which was examined exhaustively and indexed; from this material a bibliography was compiled dealing with the various aspects of wheat breeding and genetics, giving a short account of the work done in each section followed by the appropriate references. These were circulated to all Official Correspondents and to workers known to be interested in the subject. Similar bibliographies have since been compiled on the following subjects: Barley Breeding, Breeding Varieties Resistant to Disease, Lodging in Cereals, and Oat Breeding. Bibliographies on Rice Breeding and Interspecific Crosses are now in progress.

The choice of subjects to be treated exhaustively in this way is influenced by the replies to the questionnaire and inquiries received later. When a sufficient number of inquiries has been received on a particular problem this is made the subject of a bibliography and so treated more fully than individual inquiries can be.

The efficient working of the Bureau is greatly enhanced by personal contact with the workers themselves. Every effort is made, therefore, to induce officers home on leave to pay a visit to the Bureau and talk over their problems with the Deputy Director. A large number of officers attended the Fifth International Botanical Congress held in Cambridge in August, 1930. This came as a great boon to the Bureau, not only for the contributions to the Genetics and Cytology section, but also for the fact that it enabled contacts to be made with a number of colonial officers, some of whom had not even heard of the existence of the Bureau and who were thus enabled to make up for lost time and make fresh additions to the mailing list and "Information Required" file, sign the Visitors' Book, make suggestions and criticisms in the Suggestions Book and promise to tell all their friends about their new discovery. A number of foreign geneticists also visited the Bureau and cordially entered into co-operation. Since then, increasing numbers of visitors have come to the Bureau, and it is hoped that eventually the number of correspondents who have to be addressed as "Sir" will become very small indeed!

The Bureau is also peculiarly well situated for promoting contacts between workers themselves. Here again the International Botanical Congress enabled the Bureau to effect a

number of introductions between members who were known by the Bureau to be interested in similar or allied problems. Interchange of information between such workers has often been established; sometimes also seed and other material has been obtained for workers situated in out of the way places; and frequently correspondents have been put in communication with the necessary source of supply of such material.

Information can also be given on courses of study for officers home on leave, and sometimes the necessary arrangements can be made by the Bureau.

The fact that the work of the Bureau is performing a real service to overseas workers is indicated by the number of letters of appreciation and congratulation that have been received and the fact that, since the beginning of its activities in February, 1930, large numbers of letters have gone out in answer to definite inquiries. Some of these have involved the making of complete translations, others detailed summaries of foreign papers. These translations are filed at the Bureau and are also available for loan for short periods. A list of such transactions will be issued at the same time as that of the reprints available, to which reference has previously been made.

(2) BUREAU FOR HERBAGE PLANTS, UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH

Professor R. G. STAPLEDON, M.A.,
Director of the Bureau and of the Welsh Plant Breeding Station.

There is no occasion to enlarge upon the immense influence that grass land exercises on the agricultural industry of the Empire. It is, indeed, but significant of the times that when the question of co-ordinating the endeavours of agricultural scientists was under review herbage plants found a place in the recommendations made by the Imperial Agricultural Research Conference.

Although it is true that grass land has by no means been a subject neglected by agricultural reformers of earlier days, and by agricultural scientists of the last decades, it is none the less interesting to find that since the War the point of view of scientists towards herbage problems has considerably widened. This is shown, for example, by the rapidly-growing interest that is being taken in the improvement of herbage plants by modern methods of plant breeding, and it is with a view to performing in the widest interpretation and in a liberal spirit

the functions of an Imperial Agricultural Bureau in conformity with these terms of reference that the Herbage Bureau at Aberystwyth has been called into existence.

The grassland areas of the Empire are as diversified as are the soils of the Empire; they are subjected to the most varied methods of treatment, and in their present state represent the widest possible range of productiveness. The fact, therefore, that there does not exist the same body of knowledge relative to grass land all the world over, as relative to soils, renders the initiation of the work of the Bureau on the most satisfactory and helpful lines a matter of very great difficulty; it is, indeed, probable that no other Bureau will find itself in greater need of assistance and detailed information from overseas in order that it may properly fulfil and even properly define its functions.

Stated in the broadest possible terms, there are four major classes of conditions with which the grassland scientists of the Empire are concerned—and each one of these sets its own and very different problems, and all set problems that come within the province of the plant breeder. We have then to consider:—

The Temperate Climates.—Here we have our own British grass lands with their particular problems; and grass lands of a very similar nature consisting for the most part of the same European species and occupying in the aggregate enormous areas in parts of New Zealand, Australia, and Canada. It is in connexion with these grass lands that the greatest body of information already exists, and a free interchange of opinions and experiences is already proving fruitful of results, as instanced, for example, by the researches of Bruce Levy and Davies in New Zealand.* From the plant breeding point of view it has to be emphasized that because certain European species—like red clover, white clover, rye-grass, cocksfoot, and timothy—have proved themselves enormously valuable in the more temperate climates overseas, it does not at all necessarily follow that the best or most suitable strains (for the particular countries) of these species as existing indigenously in Europe have yet found their way across the seas.

Indeed, there is some evidence for thinking that in many instances this has definitely not been the case, and it is certainly

* Levy, E. B., and Davies, William. *New Zealand Jour. Agric.*, Vol. XXXIX, pp. 1 and 363, 1929, and *ibid.* Vol. XL, p. 363, 1930.

highly significant that as far as trials have gone at present there is more than a suggestion that the extra-late Montgomery clover is going to have a definite application in certain parts of New Zealand.

The underlying implication is that an important preliminary to the commencement of critical plant breeding work on European herbage species overseas would be the collection from European sources of as many types or races within each species as possible. This suggests one means by which the Bureau may be of immediate service, namely, by putting overseas workers in touch with European investigators and research stations to facilitate the exchange of plant material.

The Mediterranean Climates.—Large areas in the Empire are subjected to the Mediterranean type of climate, where the grass land vegetation consists, to a considerable extent, of annual grasses, clovers, and herbs, and of perennials that are highly resistant to drought. In many of these regions the species are largely of European origin, and here again it does not at all follow that Europe has yet contributed the best strains possible ; on the face of it, this is exceedingly unlikely, since in most cases the first introduction of those plants was quite accidental. Once more, there is a strong presumptive case for the collection and ready exchange of likely plant material.

In these and somewhat similar climates great advances will be made by a thorough study of the indigenous flora, as is evidenced by the pioneer work of Dr. Pole-Evans in South Africa, and, again, in proportion as work of this sort advances, the various parts of the Empire with substantially similar climates will naturally derive great mutual benefit by a well co-ordinated exchange of plant material.

The Northern Climates.—There is evidence to suggest that much of the work on herbage plants that is in progress in the Scandinavian countries must bear a close relationship to the herbage needs of parts of Canada, for example, and here again any action that can be taken to facilitate the exchange of plant material must be of great value.

The Tropical Climates.—The grass lands of the tropics present an almost unlimited field for research, and with reference to individual species and their application, from the very facts of the case, the Bureau has at present no first-hand information which it can place at the disposal of workers

overseas. It is hoped, however, that even here the Bureau may be able to serve a useful purpose by helping to put widely scattered workers into closer touch with each other.

The Grass Lands of the Empire as a Whole.—There are, of course, certain problems connected with the management and improvement of grass land that in their general bearing are common to all climates and to all situations. It is very important, therefore, that those whose duty it is to endeavour to make the Herbage Bureau of the maximum usefulness should have before them as accurate a picture as possible of all the chief grassland types that are to be met with both at home and overseas. It is satisfactory, therefore, to be able to state that Mr. William Davies (who is just completing a two-year period on loan to the Plant Research Station in New Zealand) has been appointed (as the result of a grant from the Empire Marketing Board) to the staff of the Welsh Plant Breeding Station for the purpose of making himself further acquainted with grassland problems overseas. The appointment in any event constitutes an interesting experiment in a direction which it is confidently to be hoped will prove a means not only of placing invaluable information in the possession of the Bureau, but also of strengthening the ties between herbage workers overseas and in this country.

The Routine Work of the Bureau.—Although naturally enough there are at the outset many directions in which the Bureau is unable to be as helpful as might be hoped, it can none the less begin to be of immediate service. The first necessity has obviously been to categorize and index the vast and very scattered literature appertaining to herbage plants, and that dealing with their genetics and cytology, and with the methods of practical breeding adopted in respect of cross-fertile species, into which category most of the herbage plants fall. This was taken in hand immediately on the appointment of Dr. Whyte as Chief Officer, and of Miss G. M. Roseveare as Librarian, and, through the enthusiasm with which they have thrown themselves into the task, our authors and subject index reaches the substantial total of 27,000 cards.

At the present time there is no considerable number of Empire workers engaged upon any one herbage plant in particular, and, although it may be desirable later on to prepare a bibliography on a plant of such wide distribution

as lucerne, for the present nothing of the sort has been undertaken. It has seemed more desirable to concentrate attention on preparing abstracts of papers current in the scattered literature. This service has been started by preparing a monthly stencilled issue, which can at present be sent to only a limited number of workers. A select list of titles of papers appearing in the various journals and periodicals is also issued monthly, as is a "Herbage Research Circular" dealing with work in progress in different countries.

Matters of general interest to herbage workers, such as notes on new methods of technique, on the production of new varieties and strains, and short accounts of conferences, are brought together and published in the form of a bulletin which is at present only being issued quarterly.

Future Developments.—The direction in which the usefulness of the Bureau develops must to a marked degree depend upon the wishes of the overseas workers themselves.

On this account any suggestions from herbage workers will be more than welcome, for above all things what is most earnestly to be desired is that the Bureau should get into the closest possible touch with individual workers, since it is the avowed policy of the Bureau to endeavour to give to every individual the type of information that will be of the greatest service. It is only after contacts have been made that it will be possible to inaugurate a regular service designed in sympathy with the type of problems that agitate the minds of the greatest number of investigators.

This is a favourable opportunity to express thanks to the Official Correspondents and others who have supplied valuable information to the Bureau in answer to a questionnaire that was sent out some months ago. These answers make it possible to form a preliminary picture of the Empire position as to herbage plants, and a general summary of all the valuable evidence will be circulated to the Official Correspondents and other interested persons in due course.

* * * * * *

THE BRITISH WOODPECKERS

F. HOWARD LANCUM, F.L.S., M.B.O.U., F.Z.S.,
Ministry of Agriculture and Fisheries.

NONE of the British woodpeckers can be said to be really common. Nevertheless, it is probable that in districts where they are regularly found, they are not so rare as is generally supposed for, although they are striking and handsome birds, they are of rather shy and retiring habits, and are never obtrusive or readily observed. When met with, their characteristic mode of perching renders them unmistakable, clinging, as they do, to the side of a tree-trunk or branch in an upright position, and using their short, powerful tails as " seats."

Each of the three British woodpeckers excavates for itself a nesting-place in a trunk or limb of some tree, and the perfectly circular entrance holes to these cavities are much more frequently seen than are the birds themselves. This wood-mining habit has given rise to the belief that woodpeckers are injurious to trees, but one may safely assume that any tree selected by a woodpecker for this purpose is either decayed or decaying. Powerful as are the bills of all our woodpeckers, these instruments would probably be inadequate to cope with the wood of any British tree were that wood not softened or shredded by the process of decay. The writer has never seen a nesting-hole in a sound, healthy tree. A glance at Fig. 3 will show that, even where a decayed tree is concerned, the work of excavation is sufficiently laborious. The photograph is one of a pine trunk split down the middle, giving a vertical half-section of a nesting cavity. In order better to illustrate its shape the cavity has been blacked in. Probably the only damage that can be attributed to a woodpecker is possible injury resulting from the stripping of bark, but even when this is done the bird's object is usually some insect which, if left to itself, would occasion more harm than the bird would do in the process of extraction.

A woodpecker's nesting-hole may justly be described as a work of art. It would, in fact, be impossible to devise a cavity more suited to the needs of the bird. It will be seen that, in the case of the green woodpecker, the entrance tunnel is just large enough to admit of the passage of the bird, and that it takes a slightly upward course. The latter is very important, as it ensures the exclusion of rain from the nesting cavity proper. Further, it will be seen that after its downward turn

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the cavity is enlarged to proportions which enable the bird to turn and sit comfortably. It descends to a depth of 9 in. or so, and at the bottom is rounded or cup-shaped. Were it flat, the woodpecker's eggs would roll about, for the bird makes no nest. As it is, the eggs are kept together in the terminal curve.

Some space may perhaps be given to that interesting habit of the great and the lesser spotted woodpeckers known as "drumming," a habit that has been the subject of much controversy both as regards its method and its purpose. The sound itself may be likened to that of a watchman's rattle, or, more imaginatively, to the staccato roll of a machine gun. Opinion appears to be sharply divided as to whether the sound is produced by vocal means or by rapidly repeated blows of the bird's bill upon the bark of a tree. The writer unhesitatingly declares in favour of the latter method, for the following reasons. If one can approach sufficiently near to observe the process, a rapid vibratory movement of the bird's head and neck will be plainly visible. Again, it will be noticed that the timbre of the sound differs with the size and nature of the trunk or limb that is being operated upon. If the bird drums upon a slender, fairly solid branch, the sound is thin and highly pitched. If a larger and more hollow branch is used, the resultant sound is correspondingly more resonant and lower in pitch. Further, if the sound were vocal, one might reasonably inquire why it is that woodpeckers are never heard to drum while in flight or while on the ground.

As to the purpose of the habit, it is supposed by some ornithologists to serve as a means of attracting or disturbing insects in the bark, and by others to be used simply as a signal to the bird's mate during the breeding season. The available evidence is strongly in favour of the latter theory, and it is significant that drumming is never heard in late summer, autumn or winter. It is difficult to believe that a woodpecker would use such a method of securing insects in the breeding season, and totally abandon it in high summer when insect life is at its zenith.

Investigation of the feeding habits of the woodpeckers will show that all of them can be definitely included in the category of beneficial birds. They are very largely insectivorous, feeding upon weevils and other beetles and injurious larvæ of many kinds. In the summer, ants form the major portion of their food, particularly in the case of the green woodpecker.

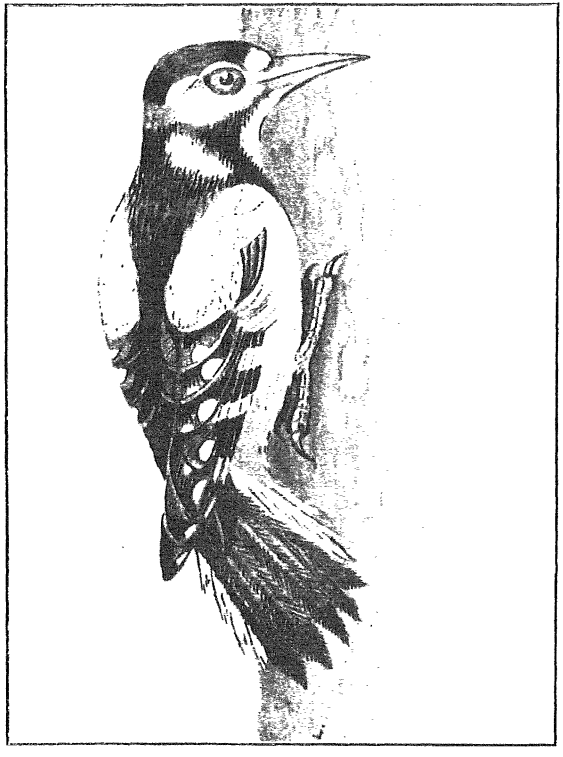


Fig. 1.—The Great Spotted Woodpecker.

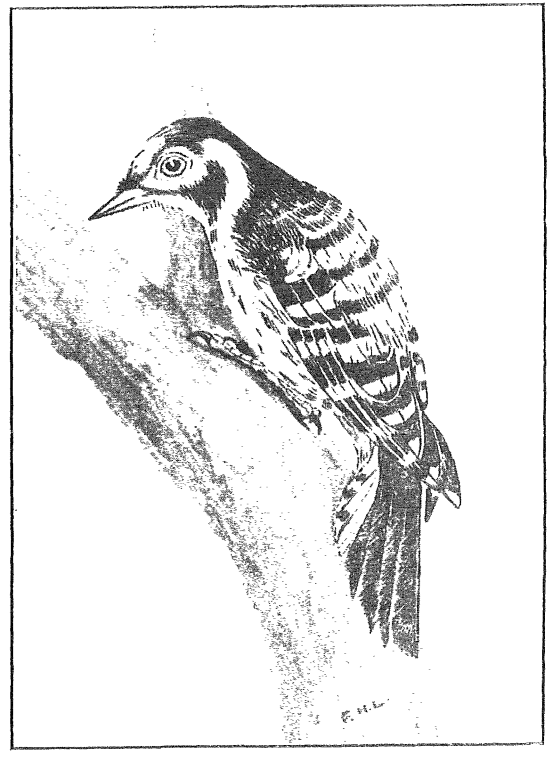


Fig. 2.—The Lesser Spotted Woodpecker.



FIG 3.—Vertical section of the Green Woodpecker's nesting-hole.

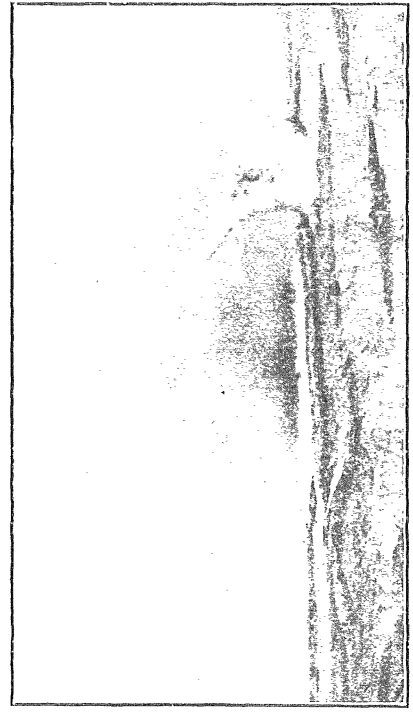


FIG. 4.—Green Woodpecker looking out from nesting hole.

The following notes on the British species may be of interest :—

Green Woodpecker.—This species has the "looping" undulating flight common to all woodpeckers, and is known by its laughing call. It is about 12 in. in length ; the upper part of the plumage is olive green, shading to yellow on the rump ; the crown and nape are crimson, and the cheeks black ; on the lower cheek there is a "moustache" stripe. In the male this stripe is crimson, edged with black ; in the female, black only. This bird is very partial to willow and ash for nesting purposes. The entrance to the nesting cavity is $2\frac{3}{8}$ in. in diameter, and it is a remarkable fact that this diameter is quite constant. Some seasons ago, the writer measured upwards of 30 entrance holes in different localities, and in none was any appreciable size-difference discovered. The eggs are pure glossy white, and from 5 to 7 in number.

The food of this species is almost entirely insectivorous. In summer, ants are the staple item of diet. At other seasons, weevils and other beetles, larvæ of many kinds, and various flies are taken. This bird is very fond of woodlice, a taste which alone would make it of value to the agriculturist.

Great Spotted Woodpecker.—This species is about 9 in. in length ; the upper parts are chiefly black, pied with white ; in the male the nape is crimson ; the adult female has no red on the head ; the cheeks are white, the wing feathers barred with white, and the under parts dull white ; the vent is crimson. The eggs, which number 5 to 7, are smaller and less pointed than those of the green woodpecker, and have a creamy tint. The entrance to the nesting cavity is $1\frac{3}{4}$ in. in diameter.

The food taken is generally similar to that of the green woodpecker, but with a fair leavening of vegetable matter. Berries of the mountain ash, holly and other trees are frequently taken, as are nuts, acorns, and occasionally the fruits of the wild rose. The writer once saw a specimen busily engaged in eating blackberries, but it is to be doubted whether this is a common practice.

Lesser Spotted Woodpecker.—This species might be described as a smaller edition of the Great Spotted Woodpecker, being only about 6 in. in length. The black of the upper parts, however, is barred rather than pied with white, and the amount

of white is proportionately greater than with the larger bird. The food consists almost entirely of insects and their larvæ. The eggs, 6 or 7 in number, are much smaller than those of the Great Spotted Woodpecker, but of the same creamy tinge. The entrance to the nesting cavity is 1¼ in. in diameter. This bird seems to be very partial to old fruit trees for nesting purposes, particularly the pear.

Natural Enemies.—The chief enemy of the woodpeckers is the sparrow-hawk, but there is reason to believe that its captures are comparatively few. All the woodpeckers are very agile on the wing, and quickly take refuge in a hole when danger threatens. So far as the Green and the Great Spotted Woodpeckers are concerned, a much more serious factor is the starling, which makes breeding difficult for the woodpeckers, especially in thinly timbered districts. In Kent, the writer once noted 11 freshly cut woodpecker holes in one season, of which no fewer than seven had been commandeered by starlings. It is a regrettable fact that, although the green woodpecker has about twice the fighting weight and bill power of the starling, a battle for the possession of a newly-finished nesting-hole almost invariably ends in a victory for the latter.

General Conclusions.—The woodpeckers cannot be regarded otherwise than as definitely beneficial birds. The nature of their food at once classifies them as friends of the agriculturist and forester. In the case of the green woodpecker, the quantity of injurious insects in the total diet may safely be estimated at not less than 70 to 80 per cent. As already stated, the woodpeckers' wood-mining operations are carried out among decayed or decaying trees. Foresters have stated that the continued presence of woodpeckers in numbers in any locality is a reliable indication that unsound trees are available, and that the birds are often of assistance in discovering decaying trees whose condition has been unsuspected by the men.

Agriculturists and others whose work is on the land should do all that is possible to protect these valuable birds, which unquestionably occupy a high place in the list of the feathered friends of man.

* * * * * *

THE ECONOMY OF WASHING KENT SHEEP BEFORE SHEARING

N. L. TINLEY, N.D.A., Dip. Agric. (*Wye*),
South-Eastern Agricultural College, Wye, Kent.

DOES it pay to wash sheep? This has been a debated question for a long time amongst sheep farmers, and for several years some co-operative societies have been advising wool growers not to wash their sheep.

Wale* (1910), working on a comparatively small number of Kent fleeces (721), found that it did pay to wash and that the increased value of the washed fleece was 10·8*d*.

The economy of washing depends on three factors: (1) The loss in weight due to washing; (2) The cost of washing; (3) The difference in price between washed and greasy wool.

The present investigation was made possible by the courtesy of Messrs. The Kent Woolgrowers, Ltd., who handle some 250,000 fleeces per annum from all parts of Kent and East Sussex. The average weight of washed and greasy ewe and teg fleeces was estimated from 360,202 fleeces and the quantity of the various grades ascertained. These results, together with the loss in weight due to washing, were calculated for five clips (1925-1929).

The Kent Woolgrowers, Ltd., grade ewe fleeces into 19 grades of greasy wool and 19 corresponding grades of washed wool. The price of each grade, the quantity of wool in each grade and the grades produced by different farmers vary considerably from year to year. The Association employs an expert grader, who allocates each fleece to its correct grade and the various grades are then pressed, baled and offered for sale on the London wool market, each grade being sold in bulk.

The average weight of washed and greasy ewe and teg fleeces and their loss in weight due to washing are shown in Table I.

TABLE I

AVERAGE FLEECE WEIGHTS FOR WASHED AND GREASY KENT EWES AND TEGS FOR THE YEARS 1925-1929 (SHOWING LOSS IN WEIGHT DUE TO WASHING).

Number	1925	Difference	
	lb.	lb.	Per cent.
38,176 greasy ewes averaged	7.99		
5,932 washed ewes averaged	7·00	·99	12·4
13,949 greasy tegs averaged	6·79		
5,298 washed tegs averaged	5·59	1·20	17·7

* *Jour. Board Agric.*, Vol. 16, page 1.

Number	lb.	Difference lb.	Per cent.
1926			
31,812 greasy ewes averaged	7·95		
9,778 washed ewes averaged	7·16	·79	9·9
11,964 greasy tegs averaged	6·91		
7,578 washed tegs averaged	5·85	1·06	15·3
1927			
37,552 greasy ewes averaged	7·14		
12,884 washed ewes averaged	6·37	·77	10·8
11,371 greasy tegs averaged	6·39		
9,981 washed tegs averaged	5·20	1·19	18·6
1928			
46,942 greasy ewes averaged	8·25		
8,985 washed ewes averaged	7·07	1·18	14·3
17,813 greasy tegs averaged	6·67		
8,181 washed tegs averaged	5·61	1·06	15·9
1929			
50,226 greasy ewes averaged	7·50		
9,560 washed ewes averaged	6·54	·96	12·8
17,940 greasy tegs averaged	6·83		
4,280 washed tegs averaged	5·67	1·16	17·0
AVERAGE FOR THE FIVE YEARS 1925-1929			
204,708 greasy ewes averaged	7·77	—	—
47,139 washed ewes averaged	6·83	·94	12·1
73,037 greasy tegs averaged	6·72	—	—
35,318 washed tegs averaged	5·58	1·14	17·0

(1) The Loss in Weight due to Washing.—Table I indicates that the average loss in weight due to washing was 12·1 per cent. in ewe fleeces and 17·0 in teg fleeces. The increased loss in the case of tegs is due, it would appear, to the fact that the tegs are more often folded than ewes and consequently a greasy teg fleece contains a higher proportion of dirt.

(2) The Cost of Washing.—The cost of washing would be 2*d.* per ewe allowing for a loss of 1 in 500 valued at £3 and for three men to wash 500 sheep in a day in a tun hired for 2*d.* per score. The cost to a farmer with his own tun is obviously less than the cost to a farmer who has to hire a tun that may be some distance from his flock. There is a certain amount of risk attached to washing, especially with suckling ewes and weak sheep, which may contract chills or bad udders. A sheep may, on rare occasions, be lost through drowning, this being due in part to carelessness and in part to shock when the sheep are put into the water when overheated. It may be pointed out that the chief item in the cost of washing is the value of any sheep which may be lost. The writer is informed that on many farms sheep have been washed for a number of years without loss ; where this is the case the cost of washing is reduced to ½*d.* per head.

(3) The Difference in Price between Washed and Greasy Wool.—The average difference in price between washed and greasy Kent ewe wool is usually about 2½*d.* per lb., the figure being subject to much variation in the various grades and the different years.

To estimate the increased value of a consignment of wool due to washing it was decided to calculate the returns from 1,000 lb. of greasy wool each year over a period of five years and the estimated return from this wool had it been washed. To find the returns from the two groups three calculations were made :—

(a) The weight of the washed wool in each year was ascertained from the figures in Table I showing the loss in weight due to washing.

(b) The proportion of the wool that would be allocated to the various grades was then found.

(c) The value of the two groups was then calculated by multiplying the number of lb. in each grade by its price per lb.

The quantity of wool in each grade and the price per lb. vary year by year, therefore all the calculations were made for each year separately for the five years (1925-1929).

The increased returns due to washing are shown in Table II.

TABLE II

	£	*s.*	*d.*	£	*s.*	*d.*
1925						
Value of 1,000 lb. of greasy ewe wool ..	57	10	5¾			
Equivalent 879 lb. of washed ewe wool..	58	8	2½			
Increased value due to *Washing* ..				0	17	8¾
1926						
Value of 1,000 lb. of greasy ewe wool ..	54	11	5½			
Equivalent 901 lb. of washed ewe wool..	56	5	8			
Increased value due to *Washing* ..				1	14	2½
1927						
Value of 1,000 lb. of greasy ewe wool ..	64	17	11¼			
Equivalent to 893 lb. of washed ewe wool	68	16	11¾			
Increased value due to *Washing* ..				3	19	0½
1928						
Value of 1,000 lb. of greasy ewe wool ..	71	1	6¼			
Equivalent 857 lb. of washed ewe wool..	70	0	3½			
Increased value due to *Not Washing*				1	1	2¾
1929						
Value of 1,000 lb. of greasy ewe wool ..	49	3	8½			
Equivalent 872 lb. of washed ewe wool..	52	3	10¼			
Increased value due to *Washing* ..				3	0	1¾
Summary of five years						
Increased value due to washing	8	9	10¾			

Summary.—Table II shows that a woolgrower producing 1,000 lb. of greasy ewe wool per annum (the produce of 128

ewes) would have increased his gross returns by £8 9*s*. 10¾*d*. in five years if his sheep had been washed. From this gross return the cost of washing must be deducted. This, as already pointed out, varies from ½*d*.-2*d*. per head per annum or from £1 6*s*. 8*d*. to £5 6*s*. 8*d*. for the 128 ewes for the five years. Each farmer can decide for himself whether under his conditions the washing would be a profitable procedure.

In the case of tegs, the balance in each year was much in favour of not washing, the big loss in weight not being compensated for by a proportionate increase in the price of the washed wool. Tegs which are folded in arable land, however, are frequently so dirty that shearing cannot reasonably be carried out unless they have been washed.

In conclusion, the writer wishes to thank Messrs. The Kent Woolgrowers, Ltd., for making this investigation possible and the Secretary, Mr. F. C. J. Swainson, for his valuable help.

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CONTROL OF THE APPLE CAPSID

AN ACCOUNT OF SOME FIELD EXPERIMENTS DURING 1930

M. D. AUSTIN, F.E.S.,

Entomological Department, South-Eastern Agricultural College, Wye.

THE serious damage caused by the Apple Capsid (*Plesiocoris rugicollis* Fall.) is still widespread, and adversely influenced the apple crops in many districts last year and in previous seasons.

Valuable experimental work by Staniland and Walton (see this JOURNAL, Sept. and Dec., 1929) indicated that the "Long Ashton" type of tar-distillate wash would go far to eliminate this pest.

At the suggestion of the late Professor F. V. Theobald a series of experiments upon the control of the Apple Capsid in its egg-stage were carried out by the writer. These experiments included the use of various proprietary "Long Ashton" washes and others of a similar type, and were carried out during the winter of 1929-30.

Results obtained from two centres are given here:

Centre I: Crockenhill, Kent.—For the purpose of this trial Mr. S. Lee kindly gave the use of eight rows each of two varieties of apple, namely Allington and Derby, known to have been heavily infested with the apple capsid. The rows of

Allingtons consisted of 12 trees each, and those of the Derbys of 22 ; all the trees were half-standards.

The various washes used (Table I) were applied on February 14, 1930, in ideal spraying conditions, at a pressure of 200-240 lb. The nozzles were used with No. 1 discs. Approximately two gallons of wash were used per tree, each tree being washed efficiently according to current practice. Any spray-drift which occurred was of only local importance ; in no case did it happen on a large enough scale to prejudice the results obtained. The weather following the application of the washes was very good, and thus ensured that the washes had every chance to dry upon the trees.

TABLE I

Derbys	*Treatment*	Per cent.
Row 1.	Petroleum Oil Wash	10
,, 2.	Standard Tar-Distillate	12½
,, 3.	Control	
,, 4.	Two-Solution L.A.* "A"	10
,, 5.	Modified L.A. "A"	10
,, 6.	Control	
,, 7.	Modified L.A. "B"	12½
,, 8.	Modified L.A. "B"	12½
Allingtons	*Treatment*	
Row 1.	Modified L.A. "C"	10
,, 2.	Standard Tar-Distillate	12½
,, 3.	Control	
,, 4.	Two-Solution L.A. "A"	10
,, 5.	Control	
,, 6.	Control	
,, 7.	Modified L.A. "B"	12½
,, 8.	Modified L.A. "B"	12½

* L.A.= Long Ashton.

Analyses of samples of these tar oil washes by Mr. H. Martin, of the Chemical Research Department of the South Eastern Agricultural College, gave the following figures :—

Percentage by weight

	Neutral oils	Tar bases	Tar acids	Total tar oils
Standard Tar Distillate	b.p. > 260° C.	*67·0	2·7	1·7	71·4
Modified "L.A." A.	b.p. > 260° C.	73·0		0·6	73·6
Modified "L.A." C.	b.p. > 260° C.	60·0		2·0	62·0
Two-Solution "L.A."	b.p. > 200° C.	† 69·9	5·8	0·6	76·3

* Boiling point above 260° C.

†Of the combined neutral and basic fractions an amount of oil corresponding to 13·2 per cent. by weight of the wash distilled over between 200° and 260°C.

Examinations of this trial were made at various periods during the season; the hatching of the capsids commenced at the latter end of April and continued until about May 12.

Leaf-damage was very noticeable on May 12, when it was also ascertained that the capsid population on the control trees was approximately three times as great as on the washed trees. Later examinations showed that the capsid-infestation on all rows of the Derbys was severe, the Allingtons being but slightly infested.

A thorough examination was made on June 10, when the various washed rows of the Derbys showed up fairly well against the control rows, which were heavily attacked; the Allington control rows were not attacked to such a marked degree. The following were the figures obtained with reference to leaf-damage on that date :—

TABLE II

Percentage Leaf-trusses marked by Capsid Bug.

Derbys	Per cent.	*Allingtons*	Per cent.
Row 1.	15	Row 1.	5
,, 2.	5	,, 2.	Trace
,, 3.	25	,, 3.	15
,, 4.	5	,, 4.	5
,, 5.	10	,, 5.	15
,, 6.	45	,, 6.	20
,, 7.	10	,, 7.	Trace
,, 8.	5	,, 8.	Trace

Shoot-damage was also observed to occur to a very serious degree, and this was more noticeable on the trees in the control rows of the Derbys, but nevertheless was also present in various degrees on all washed trees.

Examinations for fruitlet-damage gave figures almost identical with those obtained in the final examination (Table III).

The fruit from each tree on all of the rows was picked by Mr. Lee's men, and graded, counted and weighed by Mr. Edenden and the writer on September 11 and 12. The fruits were sorted into two grades, those with any trace of capsid-markings being placed in the "Capsid-Marked" grade and only those fruits entirely free from such markings in the "Clean" grade. The weights were taken to supplement the results of a similar series of experiments carried out at Crockenhill last year (see *Journ. S.E. Agric. College*, 1930). Table III gives in detail the results obtained from each row.

Discussion.—The results obtained with the Derbys at the Crockenhill centre indicate that in no case did any of the

TABLE III

	Wash		Number of Fruits					Weight of Fruits in Lb.				
			Clean	Capsid-marked	Total	Clean	Capsid-marked	Clean	Capsid-marked	Total	Clean	Capsid-marked
Derbys		Per cent.				Approx	imate%				Approx	imate%
Row 1	Petroleum Oil Wash ..	10	11	176	187	5·9	94·1	2½	46	48½	5·2	94·8
,, 2	Standard Tar-Distillate ..	12½	300	575	875	34·3	65·7	92	163	255	36·1	63·9
,, 3	Control		26	262	288	9·0	91·0	8½	61½	70	12·1	87·9
,, 4	Two-Solution L.A. "A" .	10	537	572	1,109	48·4	51·6	154	139	293	52·6	47·4
,, 5	Modified L.A. "A" ..	10	539	1,218	1,757	30·7	69·3	151	289	440	34·3	65·7
,, 6	Control		1	148	149	·7	99·3	¼	29	29¼	·8	99·2
,, 7	Modified L.A. "B" ..	12½	109	739	848	13·0	87·0	33	154	187	17·6	82·4
,, 8	Do. do. "B" ..	12½	606	1,017	1,623	37·3	62·7	183	263	446	41·0	59·0
Allington												
Row 1	Modified L.A. "C" ..	10	83	19	102	81·4	18·6	22½	4¼	26¾	84·1	15·9
,, 2	Standard Tar-Distillate ..	12½	126	11	137	92·0	8·0	33½	2	35½	94·4	5·6
,, 3	Control		31	12	43	72·1	27·9	7½	2¼	9¾	76·9	23·1
,, 4	Two-Solution L.A. ..	10	106	57	163	65·0	35·0	29	13	42	69·0	31·0
,, 5	Control		4	14	18	22·2	77·8	1½	2	3½	42·9	57·1
,, 6	Control		0	3	3	—	100·0	0	½	½	—	100·0
,, 7	Modified L.A. "B" ..	12½	13	38	51	25·5	74·5	3	9	12	25·0	75·0
,, 8	Do. do. "B" ..	12½	41	57	98	41·8	58·2	12	12	24	50·0	50·0

washes used give a commercial control of the Apple Capsid and that the various washes used would normally have had to be followed up with a contact insecticide in the spring or summer if anything approaching a clean crop was to be obtained. On the Allingtons the fruit-crop was so small that the value of the final fruit-grading must be regarded as negligible.

That these washes did partially control the Apple Capsid is shown more convincingly in Table II, where the amount of leaf-truss damage is shown. Bearing in mind that a few capsids can cause a vast amount of damage, it will be seen in the final table that the amount of fruit free from capsid-markings in any one row is far from satisfactory. The figures also fail to give a fair comparison of the capsid-infestation on the various rows.

Finally, it would seem from the last table that the various washes failed to give an adequate control, and it is, therefore, suggested that some contact wash in the spring should be used as a supplement to the winter washing.

Centre II: Hernhill (Faversham) Kent.—Through the courtesy of Mr. T. W. Bones the use of a small plantation of apples was obtained for the purpose of a tar-distillate trial.

The plantation consisted of five rows of the variety Ingestre, and ten of Worcesters, and for the purpose of this trial only four rows of the Worcesters were used and all of the Ingestres.

The washes used are indicated in Table IV and were applied in ideal spraying conditions on February 12, 1930, by means of a power-machine working up to an approximate pressure of 150 lb. Any spray-drift was only local and did not spread to other rows—the spraying being carried out very efficiently.

TABLE IV

Ingestres	*No. of trees*	*Treatment*	Per cent.
Row 1.	6	Modified L.A. "D"	12
„ 2.	6	Control	
„ 3.	7	Two-Solution L.A. "B"*	10
„ 4.	5	Modified L.A. "E"	12
„ 5.	7	Two-Solution L.A. "B"	10
Worcesters			
Row 6.	5	Two-Solution L.A. "B"	10
„ 7.	5	Modified L.A. "D"	12
„ 9.	4	Control	
„ 12.	5	Standard Wash	12

* The makers state that in this preparation Agral W.B. has been replaced by a sulphonated oil of their own manufacture.

Examinations of this trial were made at various intervals throughout the season from the date of hatching of the apple capsid (April 16) until the picking of the fruits.

Leaf-damage was observed early in May, and from thence onwards until June it steadily increased, and at an examination in early June the following figures were obtained :—

TABLE V

	Approximate Percentage Capsid-damaged leaf-trusses
Row 1	20
„ 2	45
„ 3	10
„ 4	10
„ 5	5
„ 6	5
„ 7	5
„ 9	30
„ 12	5

The figures for leaf-truss damage caused by the capsid bug probably give a fairer indication of the relative intensity of capsid-infestation on the respective rows, and, although but a supplement to the final fruit-grading figures, have a certain amount of importance and as such should not be entirely ignored, especially when it is remembered that a few capsids are capable of causing a great deal of damage. In this connexion the leaf-truss damage figures for the Worcesters (Rows 6, 7, 9 and 12) would indicate that the capsid-infestation was more or less equal on all the sprayed rows.

Shoot-damage was also observed on the control row of the Worcesters, otherwise such damage was not general.

As soon as the fruitlets were formed the capsids transferred their attention to these and subsequently new leaf-damage was scarce.

During late June and July the treated rows of the Worcesters showed up well against the control row ; their comparative freedom from serious leaf-damage and the comparatively few fruitlets attacked gave the trees a very healthy appearance.

The fruits were picked by Mr. Bone's staff on September 9 and 10, and were graded by the writer ; on the 9th Mr. R. Hart (of the Borden Farm Institute) kindly assisted with the counting of the fruits.

Table VI gives the results of the grading, etc.

Discussion.—The results obtained from the Hernhill centre indicate that, on the two varieties of apples used in the experiment, the apple capsid can be controlled in the egg-stage with certain washes.

A reduction of capsid-damaged fruit from a reasonably high figure to below 15 per cent. is to be desired (*See Jour. S.E. Agric. College*, Wye, 1930), and this we find has been accomplished by the use of washes on both Worcesters and Ingestres.

TABLE VI

Wash			Number of Fruits			Percentage Number of Fruits	
			Clean	Capsid-damaged	Total	Clean	Capsid-damaged
Ingestres							
Row 1 ..	Modified L.A. "D" ..	12 per cent.	1,245	3,154	4,399	28·3	71·7
„ 2 ..	Control		562	1,514	2,076	27·1	72·9
„ 3 ..	Two-Solution L.A. "B" ..	10 „	2,805	370	3,175	88·3	11·7
„ 4 ..	Modified L.A. "E" ..	12 „	3,224	467	3,691	87·3	12·7
„ 5 ..	Two-Solution L.A. "B" ..	10 „	4,517	393	4,910	92·0	8·0
Worcesters							
Row 6 ..	Two-Solution L.A. "B" ..	10 „	1,635	62	1,695	96·3	3·7
„ 7 ..	Modified L.A. "D" ..	12 „	2,161	325	2,486	86·9	13·1
„ 9 ..	Control		2,057	780	2,837	72·5	27·5
„ 12 ..	Standard Wash	12 „	3,435	94	3,529	97·3	2·7

Although most of the washes that were tested proved to be successful it would have been necessary to follow up with a contact wash or dust in the spring to deal effectively with the remaining capsids, which, although present in small numbers, serve to reinfest the trees the following year.

The leaf-truss damage figures in this experiment, especially in connexion with the Worcesters, indicate that on the washed trees the capsid-infestation was more or less the same, and these figures therefore probably give a fair indication of the respective merits of the washes used in achieving their purpose of controlling the apple capsid in its egg-stage.

Although the final figures vary somewhat it is conceivable that any variation might well be due to factors other than the actual value of the washes used. It is desirable to mention that at various examinations made during the season immature capsids were observed to show a tendency to leave the trees through various causes—winds, etc.—and it is possible that the capsids may have spread from tree to tree (or row to row) by way of the ground.

Summary.—Details are given of experimental work on the control of the Apple Capsid (*P. rugicollis* Fall.) in its egg-stage; mention being made of various washes that were used, including "Long Ashton" washes, and the results obtained are given in brief.

From these results it is indicated that on some varieties of apple a commercial control of the capsid may be obtained, but results on others are not so good.

It is also suggested that figures relating to leaf-truss-damage are worthy of examination in connexion with the estimation of relative intensity of capsid-infestation on different rows.

It is indicated that the use of winter washes must, in many cases, be followed up with contact insecticides where capsid-infestation occurs in the spring; this should effectively supplement the winter washing and go far to eliminate the pest under review.

Finally, any comparison of the relative merits of the washes used at Centres I and II should not be attempted, the fact that different varieties of apples were used in these centres ruling out any fair comparison. The results from these two centres are incorporated here for convenience only.

Acknowledgments.—The writer wishes to record his thanks to the fruit-growers who so kindly loaned their orchards and spraying-outfits for the purposes of these experiments, to

the various firms concerned for materials, and to Mr. R. Hart and Mr. F. Edenden for their valued assistance during the apple-grading. To Mr. Theobald (of Hernhill) too, the writer is greatly indebted for his kind assistance at various periods during the season.

* * * * * *

THE TIME FOR APPLYING NITRATE OF SODA TO SUGAR-BEET

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DURING the three years 1924, 1925 and 1926, a series of trials was carried out at the Norfolk Agricultural Station to determine the maximum amount of nitrate of soda which could profitably be applied as top-dressings to sugar beet. The object of the trials was to test, under English conditions, the Continental practice of applying up to 4 cwt. per acre of nitrate of soda to a crop receiving farmyard manure, phosphate and potash. Of the usual manurial components, nitrogen is almost always the most effective in increasing yield, the most certain in action, and the most expensive to buy. Hence it was clearly desirable to ascertain, if possible, the economic limit to its use.

The result of the trials showed that, on fairly light land, the economic limit was 3 cwt. per acre of nitrate of soda, at which amount maximum yield was obtained. The results also indicated, however, that on soils normally capable of giving high yields, and where other conditions, *e.g.*, moisture and temperature, do not limit growth, a fourth cwt. might profitably be used in most seasons. There was no depression in the sugar content provided all the 3 cwt. were put on early, but, where the final top-dressing was applied some six weeks after singling, a depression in percentage of sugar occurred, due to the crop not being ripe when lifted. The general trend of the experiments showed that where late applications of nitrogen were given, the crop should not be lifted until late, and even then a depression in sugar content might occur.

It was then suggested that, to save labour, the whole of the 3 cwt. of nitrate of soda might be applied to the seed bed, thus eliminating the necessity and expense of top-dressing. Doubts were raised as to the effect on sugar content of such a large single dose of nitrate of soda, but that beneficial results could be expected was suggested by Continental practice in sugar-beet growing, in which it is recognized that large dressings of nitrogenous fertilizer may have a detrimental effect on the

sugar content, the remedy being to apply the fertilizers as early as possible. Thus nitrate of soda is frequently applied in February and March, the crop not being drilled until April. Accordingly, in 1927, a trial was started to compare the effect of 3 cwt. per acre of nitrate of soda given all on the seed-bed, with the same quantity applied as top dressing at different stages in the growth of the crop.

Method of Trial.—The trials were laid down on the Latin square principle, which gives control of variations in soil fertility, and enables an accurate estimate of the reliability of the results to be obtained. There were four treatments as follows :—

(a) Nitrate of soda : 3 cwt. per acre all on the seed-bed.
(b) " " 1½ " " on the seed-bed.
" " 1½ " " at singling.
(c) " " 1 " " on the seed-bed.
" " 1 " " at singling.
" " 1 " " 3 weeks after singling.
(d) Control (no nitrate of soda).

Treatments (b) and (c) were included, because it was essential that the seed-bed application of nitrate of soda should be compared with the other possible times of application, to ascertain any effect on yield or percentage of sugar, in addition to the expected saving in labour.

All the plots received a basal dressing of farmyard manure, phosphate and potash as follows : 8 tons per acre farmyard manure, 3 cwt. per acre superphosphate, 2 cwt. per acre 30 per cent. potash salts in 1927 and 1928, and 1 cwt. per acre muriate of potash in 1929 and 1930. The variety sown was Dippe W.I. in 1927, Kleinwanzleben N in 1928, and Kuhn P in 1929 and 1930, at a seed rate of 15 lb. per acre in each year. The rows were drilled 18 in. apart on the flat, and the plants were singled to 10 in. The plots were all treated as part of the farm crop as regards cultivations, except that the nitrate of soda was applied by hand, and the men were told to use extra care when singling to ensure as even a plant-population as possible on all plots. In addition, all the plots were singled the same day. At harvest, each plot was lifted separately and the beet carefully topped, washed and weighed. Duplicate samples of ten beet each were taken from each plot, for sugar analysis. No weights of tops were made. In the 1927 and 1928 trials, the plots were 1/40th acre in size, and in 1929 and 1930, 1/60th acre. The soil on the Sprowston farm is a medium-light loam overlying brick earth. The average annual rainfall is 25·24 in.

The trial has been carried out each year since 1927, and although other comparisons were added in 1929, the basic principle of comparing the three different applications of N.S. has been continued each year up to and including 1930.

Results.—Table I gives the average yields of washed beet per acre for each of the four years. The standard error per plot, and the significant difference, are included for those interested in the statistical interpretation of the results. The significant difference is calculated from the standard error and is a difference due solely to the effect of treatment and not to errors of weighing, etc., or differences in soil fertility. The high standard error in the 1928 trial arose from the unevenness of some of the plots caused by the development of a "scald," *i.e.*, the effect of a sharp drought in September on an outcrop of gravel, covering some of the plots.

TABLE I.—YIELD OF WASHED BEET PER ACRE.

	1927	1928	1929		1930
Date of lifting	November	October	Oct.	Dec.	December
	ton cwt.	ton cwt.	ton cwt.	ton cwt.	ton cwt.
3 cwt. per acre nitrate of soda on seed-bed.	12 4	12 5	12 10	13 18	13 14
1½ cwt. per acre nitrate of soda on seed-bed. 1½ cwt. do. at singling.	12 0	12 2	12 10	13 18	13 18
1 cwt. per acre nitrate of soda on seed-bed. 1 cwt. do. at singling. 1 cwt. do. 3 weeks after singling.	12 2	12 12	12 12	13 16	13 6
Control	10 0	11 2	11 0	11 18	11 0
Standard error per plot	13 cwt.	20 cwt.	8 cwt.	8 cwt.	11 cwt.
Significant difference .	19 cwt.	42 cwt.	11 cwt.	10 cwt.	13 cwt.

In no one year was there a significant difference in the yield of the plots receiving nitrate of soda. In 1930, the difference of 12 cwt. between the plots receiving nitrate of soda in two doses, and those receiving it in three doses, is not quite significant, and therefore can be disregarded. As would be expected in

each year there is a considerable difference in yield between the plots receiving nitrate of soda and the control (no nitrate of soda) plots.

Tables 2 and 3 give respectively the percentage of sugar and weight of sugar per acre for each year.

TABLE 2.—PERCENTAGE OF SUGAR.

	1927	1928	1929 Oct.	1929 Dec.	1930
3 cwt. nitrate of soda on seed-bed	17·2	18·5	19·6	17·9	16·4
1½ cwt. nitrate of soda on seed-bed. 1½ cwt. do. at singling.	17·3	18·6	19·8	17·9	16·0
1 cwt. nitrate of soda on seed-bed. 1 cwt. do. at singling. 1 cwt. do. 3 weeks after singling.	17·0	18·6	19·4	17·9	16·0
Control	17·4	19·2	19·8	18·1	16·4

TABLE 3.—WEIGHT OF SUGAR PER ACRE (Cwt.)

	1927	1928	1929 Oct.	1929 Dec.	1930
3 cwt. nitrate of soda on seed-bed	41·0	45·3	49·0	49·8	44·8
1½ cwt. nitrate of soda on seed-bed. 1½ cwt. do. at singling.	41·5	45·0	49·5	49·8	44·6
1 cwt. nitrate of soda on seed-bed. 1 cwt. do. at singling. 1 cwt. do. 3 weeks after singling.	41·1	46·9	48·9	49·4	42·4
Control	35·0	42·6	43·8	43·1	36·1

There is no great variation in any one year in the sugar content of any of the plots receiving nitrate of soda. As would be expected, however, the control plots were always equal to, if not higher than the manured plots, showing that depression of the sugar content to a slight but varying degree occurs whenever nitrogen is applied. The yield of sugar per acre, which expresses the combined effect of yield per acre and percentage of sugar, is in each year remarkably constant on the plots receiving nitrate of soda. An exception is 1930, where the lower yield of the plots, top-dressed twice (13 ton 6 cwt.), is reflected in a lower weight of sugar per acre (42·4 cwt.), the percentage of sugar being much the same as on the other plots.

Influence of Rainfall.—A study of the tables of yield and percentage of sugar shows no apparent discrepancies. Perhaps the chief objection to applying all the nitrate of soda on the seed-bed is that there might be a considerable part of the nitrogen washed out of the soil before the plants are able to make use of it. The tables of yield and percentage of sugar,

therefore, may perhaps be studied profitably in conjunction with Table 4, which gives the amount of rainfall for the months of April, May and June in each year. Only these months are included, since it is not unreasonable to assume that only in these months is the maximum "leaching" of nitrogen out of the soil likely to occur.

TABLE 4.—RAINFALL PER MONTH IN INCHES

	1927	1928	1929	1930	Normal
April	1·51	1·29	1·08	1·76	1·61
May	0·94	1·83	1·00	2·92	1·83
June	4·73	2·45	0·86	1·47	1·89
TOTAL	7·18	5·57	2·94	6·15	5·33

So much of the value of the interpretation of the results depends upon the rainfall in each year that it will be best to discuss the figures for each year in turn.

In 1927, April was a normal month as regards rainfall, May was dry, June was very wet. The crop was drilled on April 26 and singled the first week in June. Hence the final top-dressing was applied to the appropriate plots about the end of June. The results seemed to show that, with a normal rainfall in April, application of nitrate of soda to the seed-bed is possible with very satisfactory results. It is, perhaps, necessary to point out that, although June was a very wet month, most of the rain fell in the midlde of the month and there was very little at the beginning and end, *i.e.*, when the top dressings were applied. Consequently one would not expect there to be much "leaching" of the June-applied nitrogen from the soil, and as there is no difference in the yields it is presumed that this is so.

The average rainfall for the three months in 1928 can be regarded as normal. The trial was drilled on April 23 and singled on June 7, so that the final top-dressing, again, was given at the end of June, but the crop made very slow growth until midway through May. A drought set in during September, and this, combined with a patch of gravel covering some of the plots, made the results not quite so satisfactory, from an experimental point of view, as in other years. The general trend, however, is the same, namely, no difference between the yields or sugar percentages of any of the plots receiving N.S.

In 1929, there was a severe drought throughout the summer, although the crop made very good growth until the drought set in. The rainfall in April, May and June was low, the total for the three months being just over one-half of normal. The beet were drilled on April 17 and singled on June 5. In the two previous years, the crops had been lifted rather early in the

season, and it was thought that this might have favoured those plots receiving all the nitrate of soda on the seed bed. Accordingly, in 1929, each crop was divided into two, one half being lifted in October and the other half in December. Thus a comparison was obtained of the effect of early and late lifting. The yields show that in a dry year, time of application of nitrate of soda need not affect the time of lifting of the crop. As will be seen from the tables, an increase in yield per acre of just under 30 cwt. on the manured plots, and of 18 cwt. on the control plots, was gained by not lifting until December. Nevertheless, the yield of sugar per acre for October lifting and December lifting was the same, as the increase in yield was nullified by a drop in sugar content. It is worth noticing that the increase in yield was greater on the manured plots than on the control plots, showing that the beneficial effect of the nitrogenous manure continued, irrespective of time of application, until late in the lifting season.

1930 had, in contrast, an abnormal rainfall in April, May and June; April and May, especially, having a rainfall considerably above normal. The plots were drilled on April 16, and the crops singled on May 24. The results are of exceptional interest, as in addition to the heavy rainfall, the trial was on some of the lightest land at Sprowston. With these conditions, then, it would be expected that a maximum amount of leaching of nitrogen would occur with the nitrate of soda applied on the seed-bed, and a consequent detrimental effect on the yield and percentage of sugar. The results, however, were in accordance with previous years, and there was no significant difference in yield per acre or percentage of sugar on any of the plots receiving nitrate of soda. Thus it is reasonable to assume that there was no loss of nitrogen from the plots receiving all the nitrate of soda on the seed-bed. Perhaps it would be more correct to say that the loss of nitrogen from the plots receiving all the nitrate of soda on the seed bed was no greater than on those plots receiving the nitrate of soda in two or three doses.

Discussion of Results.—The response of a crop to a manure depends primarily upon the amount of moisture in the soil, providing, of course, that there is no other factor limiting growth. The amount of moisture, in turn, is controlled to a great extent by the amount of rainfall, and hence the response of a crop to a manure depends chiefly on the amount of rainfall which the crop receives, especially around the time the manure is applied. The four years in which this trial has been

running at Sprowston give a fairly representative selection of rainfall conditions (for the three months after sowing sugar-beet) which would normally be met with in practice. Thus the table of rainfall may be summarized briefly as follows: 1927 had a dry May, a normal April and a very wet June; in 1928 the rainfall was close to normal; 1929 was exceptionally dry in each of the important months; while in 1930 April and May were very wet, and June fairly dry. Obviously, these four years cannot represent all the possible variations in rainfall conditions which are likely to occur, but it would appear that, included in this period, are the extreme variations for any one year which are likely to be encountered in practice.

The results of the trial have shown that on sugar-beet the actual top-dressing with nitrate of soda is unnecessary, for quite as good results can be obtained by applying the whole of the 3 cwt. to the seed-bed. Thus one sowing is sufficient, instead of the two or three required if the crop is top-dressed. The actual saving in labour, as measured by its cost, is small, as an average cost for one top-dressing is, roughly speaking, about 1s. per acre, excluding the cost of the manure. Seed-bed applications may, however, prove to be helpful when the pressure of work is likely to be heavy later in the season. Once the manure is applied, the job is done and finished with. With top-dressings given late in June, a difficulty will sometimes arise in that this work coincides with the hay harvest. The difficulty is obviated by applying all the nitrate of soda to the seed-bed, and thus omitting top-dressing.

From the standpoint of effect on the plants, there is much to be said for seed-bed applications. The plants have an adequate supply of soluble nitrogen from the start and consequently stimulation of growth is most effective and the rate of growth is rapid. In addition, the scorching of leaves, which frequently occurs with top-dressing, is avoided. A further disadvantage of top-dressing is that the trampling of the horse and the wheeling of the manure drill on the rows, especially at the headlands, often mean a loss in plant population.

As regards evenness in distribution of the manure, 3 cwt. per acre is more easily applied in a satisfactory manner than 1 cwt. or 1½ cwt. per acre. Few manure drills will give a really even distribution when sowing the smaller amounts, but most drills will sow 3 cwt. per acre satisfactorily. With seed-bed applications, the nitrate of soda is spread all over the field, whereas with top dressings the manure is applied along the rows. It is doubtful if this difference in distribution has any

material effect on the crop, although with a row width of, say, 24 in. it is possible that there is more loss of nitrogen when the manure is spread all over the field than would be the case when the rows are drilled only 15 in. apart.

Seed-bed applications of nitrate of soda, as shown by the results of the trials, reduce to a minimum the possibility of a depression in the sugar content consequent on the application of heavy dressings of nitrogenous fertilizer. Where late-sown beet are top-dressed there is nearly always a depression in the percentage of sugar, as the beet do not mature fully until very late in the lifting season, or they may not even ripen off at all. In such cases especially the application of all the nitrate of soda to the seed-bed should greatly reduce the possibility of a depression in the sugar content, as the manure is applied at the earliest opportunity, and ripening is not delayed to the same extent as with top-dressings.

One point, noticed in the trials, was that the seed-bed applications encouraged the early growth of weeds, and it is possible that this early growth might tend, in some cases, to increase singling difficulties. Indeed, in one field of sugar-beet in Norfolk, where all the nitrate of soda had been applied to the seed-bed, the plant population actually suffered, the growth of weeds making accurate singling very difficult. This would appear to be a serious objection to the practice of seed-bed application of nitrate of soda, although, in the actual trial, no difficulty was experienced in singling the plots, and a remarkably constant plant population from plot to plot was obtained each year.* The extent of this early growth of weeds no doubt depends upon the condition of a field, whether clean or dirty at the start. The early growth of weeds indicates that some of the nitrogen in the fertilizer has been taken up by the weeds and is therefore lost to the sugar-beet plants.

In the event of total failure of a field of sugar-beet through wireworm attack, for instance, the whole of the nitrate of soda would be lost if it had all been applied to the seed-bed unless, of course, a crop of another kind is taken. The monetary loss might be considerable, but it is not unreasonable to assume that unforeseen total failures are not so widespread as to make the application of the nitrate of soda to the seed-bed unduly risky.

The conclusions drawn above are for sugar-beet grown on

* The greatest difference was in 1928, when plots receiving N.S. on the seed bed averaged 26,040 plants per acre, whereas plots receiving N.S. in two doses averaged 27,080 plants—a difference of 1,040.

light land with an average annual rainfall of just over 25 inches, *i.e.*, under conditions fairly typical of the Eastern Counties. Whether the principles would hold for Western Counties growing sugar-beet it is not possible to say definitely. In 1930, the total rainfall at Sprowston was 30·4 inches, whereas at Newport (Shropshire) it was 33·2 inches, at Cheltenham (Gloucestershire) 34·0 inches, at Worcester 29·5 inches, and at Hereford 34·0 inches. Thus, the rainfall in 1930 at these centres was not so much above that at Sprowston as to lead one to expect that the principle of seed-bed applications of nitrate of soda for sugar-beet would not hold good also for these counties.

The trial described was initiated by Mr. F. Rayns, M.A., the Director of the Norfolk Agricultural Station, to whom the writer is indebted for many helpful and useful suggestions. The whole of the work in the trial was carried out by Mr. H. Fail, B.Sc., whose comprehensive notes form the basis of this article.

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INSPECTION AND CERTIFICATION OF STRAWBERRY PLANTS AND BLACK CURRANT BUSHES

A DESCRIPTION of the voluntary schemes of inspection and certification of strawberry plants and black currant bushes, established by the Ministry in 1927, was published in the issue of this JOURNAL for February, 1930. The following notes relate to the operation of the schemes during the past season :—

Strawberry Plants.—That the value of the strawberry inspection scheme is realized by growers is evidenced by the fact that the acreage inspected in 1930 was nearly double that dealt with in the previous year. In the light of the experience gained, it was thought desirable to modify the scheme in two respects. Growers had found it difficult if not impossible to comply with the regulations governing the issue of " super " certificates, and this part of the scheme was therefore discontinued in 1930. Reports received from Inspectors indicate, however, that many growers were pursuing the ideal represented by the " super " certificate, though they did not find it practicable to carry out the restriction of runners to the desired extent. It was decided that, while in the case of stocks certified in the previous year, one inspection only would be necessary, two inspections—one during the fruiting season and one towards the close of the season—would be required in the case of stocks not previously examined, or stocks which

failed to qualify for a certificate in the previous season. The only alteration made in the list of varieties to which the scheme is confined was the inclusion of Tardive de Leopold.

Applications were received from 141 growers, 64 of whom held certificates in 1929, for the inspection of 395 acres of plants —a considerable increase on the previous season, when 81 applications were submitted in respect of 198 acres. Nearly one-half of the applications came from the Wisbech area, 17 from Kent, 11 from the Pershore-Evesham district, the remaining cases being spread over various parts of the country mostly to the south of a line drawn from the Severn estuary to the Wash.

A comparison of the applications received in each of the last three seasons is given in the following table :—

Variety	1928		1929		1930	
	No. of Stocks	Acreage	No. of Stocks	Acreage	No. of Stocks	Acreage
Bedford Champion	15	7·1	18	11·6	45	38·9
Jucunda	4	0·7	8	2·2	14	5·7
Leader	10	3·4	15	4·9	13	5·3
Madame Kooi ..	5	2·8	12	6·3	21	12·3
Madame Lefebvre..	16	10·3	15	9·8	42	31·7
Oberschlesien ..	3	0·7	8	4·3	31	30·1
Royal Sovereign ..	50	76·6	57	92·9	94	144·3
Sir Joseph Paxton..	38	48·6	36	48·8	49	68·7
Stirling Castle ..	6	11·1	5	0·7	5	8·7
Tardive de Leopold	—	—	—	—	16	31·1
The Duke	12	9·6	12	7·2	10	6·4
The Laxton ..	6	4·8	13	8·9	17	11·8
Others	93	24·3	—	—	—	—
	258	200·0	199	197·6	357	395·0

It will be seen that the most prominent varieties were again Royal Sovereign and Sir Joseph Paxton : the most striking increases were in the varieties Bedford Champion, Madame Lefebvre and Oberschlesien : slight increases were shown by Madame Kooi and The Laxton, while The Duke, apparently, is declining in favour, a progressive decrease being shown since 1928. A substantial acreage of the new entrant, Tardive de Leopold, was submitted.

Of the total area of 395 acres submitted for inspection, 366·5 acres qualified for certificates. The remaining 28·5 acres were rejected, chiefly on account of lack of vigour in the stocks and the existence of more than 1 per cent. of rogues. An

analysis of the results of the inspections is given in the following table. It may be stated that, in some instances, rogues exceeding 1 per cent. were present in stocks which would otherwise have failed to qualify owing to lack of vigour: such cases are shown in the table as due to rogues. The heading "Lack of vigour" includes general weakness of stocks and the presence of a proportion of weak plants in stocks which were otherwise up to the standard.

Variety	Certified		Not Certified				
				Acreage			
	No. of stocks	Acreage	No. of stocks	Rogues exceeding 1%	Lack of vigour	Other reasons	Total
Bedford Champion	41	35·9	4	1·5	1·5	—	3·0
Jucunda ..	11	3·5	4	1·8	0·4	—	2·2
Leader ..	13	5·1	1	—	0·2	—	0·2
Madame Kooi ..	17	10·5	4	1·0	0·8	—	1·8
Madame Lefebvre	38	30·1	4	0·2	1·4	—	1·6
Oberschlesien ..	23	27·7	7	1·9	0·5	—	2·4
Royal Sovereign	88	133·6	9	9·0	0·2	1·5 (withdrawn)	10·7
SirJoseph Paxton	46	66·2	6	0·5	1·5	0·5 (wireworm dam'ge)	2·5
Stirling Castle..	5	8·5	1	—	0·2	—	0·2
Tardive de Leopold	15	30·9	1	0·2	—	—	0·2
The Duke ..	8	5·8	2	0·6	—	—	0·6
The Laxton ..	14	8·7	4	0·8	2·3	—	3·1
	319	366·5	47	17·5	9·0	2·0	28·5

The acreage certified represents nearly 93 per cent. of the total area dealt with compared with 72 per cent. in 1927, 78 per cent. in 1928 and 89 per cent. in 1929. This steady improvement in the general standard of the stocks is very satisfactory.

Black Currant Bushes.—The arrangements made for the operation of this scheme followed very closely those in force in the previous year. Applications for inspection were confined to bushes of two years of age or over, *i.e.*, bushes grown from cuttings taken not later than the autumn of 1928.

The numbers of bushes of each type inspected in 1930 and the previous two years are given in the following table. (Maiden bushes were first excluded from the scheme in 1929, but in the figures given below for 1928 bushes under two years old are excluded in order that a comparison may be drawn) :—

Group	Number of bushes inspected 1928	1929	1930
French Black	123,830	159,500	169,111
Boskoop Giant	26,700	58,600	53,564
Edina	37,210	54,240	30,385
Baldwin	204,110	158,520	78,023
Unclassified	130,150	114,800	66,087
Total	522,000	545,660	397,170

The number of bushes of the Baldwin group inspected in 1930 showed a reduction of 50 per cent. on the previous year's total, which itself was considerably below the 1928 figure. Whereas in 1928 this group accounted for nearly 40 per cent. of the total of all kinds, in 1930 it represented no more than 20 per cent. The French Black group became firmly established as the most important from the point of view of numbers, claiming roughly 42 per cent. of the total bushes covered. Boskoop Giant almost reached the 1929 figure, but Edina—again the lowest—and the unclassified varieties were considerably reduced.

The total of 397,000 bushes represents a reduction of 27 per cent. on the previous season's total, although, as already mentioned, the number of applications proceeded with was only two lower. In view of the condition of the industry, it was not expected that the scheme would show any advance over former years and, in all the circumstances, it may perhaps be counted as not unsatisfactory that the support of the growers did not show any greater falling off.

In the following table are given, for each group, the numbers of bushes certified as " true to type and apparently free from reversion," and the numbers rejected. The " rejection " figures are analysed as far as possible to show the reasons for rejection :—

Group	Certified		Rejected			
	No.	Percentage of total inspected	Rogues exceeding 1%	Reversion.	Lack of vigour or insufficient growth	Total
French Black	122,361	72	—	—	46,750	46,750
Boskoop Giant ..	43,214	80	8,100	—	2,250	10,350
Edina ..	20,635	68	—	—	9,750	9,750
Baldwin ..	75,873	97	—	1,900	250	2,150
Unclassified	61,087	92	—	5,000	—	5,000
	323,170	81	8,100	6,900	59,000	74,000

The percentage of bushes certified (81) compares unfavourably with the figures for the previous years—88 per cent. in 1929 and 84 per cent. in 1928. This low figure is attributable, however, to the rejection of two stocks in rather unusual circumstances. The stocks in question (40,000 French Black and 8,000 Edina) were two- and three-year bushes that had been cut back hard in the spring, and by the time of inspection had made insufficient growth to enable the Inspector to certify them as apparently free from reversion. If these stocks are excluded from the calculations, the proportion of bushes certified is nearly 93 per cent. of the total—a marked improvement on previous years.

It is of interest to note that the presence of rogues exceeding the limit of 1 per cent. was responsible for the rejection of only about 8,000 bushes, and that the stocks involved were all of the Boskoop Giant group. Less than 7,000 bushes were refused certificates owing to the existence of reversion, while 11,000 bushes (excluding the " cut backs " already mentioned) failed to qualify owing to lack of vigour.

New varieties of black currants make their appearance on the market every year, and some of them eventually establish for themselves a place in commercial practice. While the extent to which new varieties are being adopted cannot be deduced from this scheme, since the number of bushes inspected represents a very small proportion of those under cultivation, it may be of interest to record the following details of the number of bushes of new varieties inspected during the last two years :—

	1929	1930
Mite Free	500	900
Daniel's September Black	25,200	21,059
Westwick Choice	5,000	20,500
Blacksmith	1,000	548
Davison's Eight	74,000	38,224
Tinker	2,000	1,086
Invincible Giant Prolific	200	130

At the close of the inspection season, registers containing the names and addresses of growers of certified stocks of strawberry plants and of black currant bushes were prepared and published.

Arrangements for 1931.—Forms of application and explanatory memoranda giving particulars of these schemes for the coming season may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1. Applications for inspection must be submitted to the Ministry *on or before May* 30, 1931 ; no application will be accepted after that date.

MARKETING NOTES

National Mark Eggs.—The output of National Mark eggs continues to show substantial progress as compared with 1930. During March, 1931, approx. 25 million eggs were packed under the Mark, as compared with 15·7 million in 1930. For the first quarter of the year (January to March), the relative figures for 1931 and 1930 were approx. 58 million and 38·5 million, respectively, representing an increase of 51 per cent.

As was to be expected, the normal seasonal increase in supplies was responsible for a further fall in prices during March. The fall was, however, comparatively slight following the heavy drop in February, and National Mark eggs had a ready sale at prices which averaged for the month (per 120) 13*s.* 8*d.* for *Specials*, 12*s.* 4½*d.* for *Standards* and 10*s.* 10*d.* for *Mediums*. These figures, compared with those for March, 1930, are lower by approximately 9*d.* for each grade, and, in the light of the general fall in commodity prices that has taken place during the year, it may be said that National Mark eggs have held their position satisfactorily.

National Mark Egg Central, Ltd., continues to market increasing quantities, having handled, during recent months, as much as 17 per cent. of the total output of the authorized packers.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during March, 1930, and March, 1931, and the number of sides graded and marked for the four weeks ended April 18, 1931, were as follows :—

	LONDON	*Number of sides*
Weekly average ..	March, 1930	1,982
„ „ ..	„ 1931	2,134
Week ended ..	March 28, 1931	1,859
„ „ ..	April 4, 1931	2,065
„ „ ..	„ 11, 1931	1,627
„ „	„ 18, 1931 ..	2,163
	BIRKENHEAD*	
Weekly average ..	March, 1930	153
„ „	„ 1931	187
Week ended ..	March 28, 1931	187
„ „ ..	April 4, 1931	93
„ „	„ 11, 1931	124
„ „ ..	„ 18, 1931	66

* Sides consigned to London.

			Number of sides
	SCOTLAND*		
Weekly average	March, 1930		2,650
,, ,,	,, 1931		2,614
Week ended	March 28, 1931		2,500
,, ,,	April 4, 1931		2,609
,, ,,	April 11, 1931		2,734
,, ,,	,, 18, 1931		2,408
	TOTAL LONDON SUPPLIES (All sources)		
Weekly average	March, 1930		4,785
,, ,,	,, 1931		4,935
Week ended	March 28, 1931		4,546
,, ,,	April 4, 1931		4,767
,, ,,	April 11, 1931		4,485
,, ,,	,, 18, 1931		4,637
	BIRMINGHAM		
Weekly average	March, 1930		545
,, ,,	,, 1931		483
Week ended	March 28, 1931		451
,, ,,	April 4, 1931		454
,, ,,	,, 11, 1931		369
,, ,,	,, 18, 1931		411
	LEEDS		
Weekly average	March, 1931		776
Week ended	,, 28, 1931		700
,, ,,	April 4, 1931		648
,, ,,	,, 11, 1931		572
,, ,,	,, 18, 1931		730
	BRADFORD		
Weekly average	March, 1931		514
Week ended	,, 28, 1931		460
,, ,,	April 4, 1931		434
,, ,,	,, 11, 1931		384
,, ,,	,, 18, 1931		448
	HALIFAX		
Weekly average	March, 1931		122
Week ended	March 28, 1931		94
,, ,,	April 4, 1931		94
,, ,,	,, 11, 1931		91
,, ,,	,, 18, 1931		107

* Sides consigned to London.

At Smithfield Market, London, the trade in beef during March was featureless. The prices for imported and home-killed beef remained low as compared with the corresponding period in 1930. The total supplies of beef and veal showed an increase of 22,312 tons as against 21,058 in March, 1930. The principal rise was in supplies from the Argentine and Brazil, home-killed supplies registering a small decline. The number of home-killed and Scotch-killed sides of beef graded and marked for the London area during March totalled 21,854, an increase of 3,406 sides on the February figures.

The number of inquiries regarding the Ministry's scheme for the direct consignment of cattle from farms to Islington Abattoir for sale on a grade and dead-weight basis increased during the month, and it is expected that many of these inquiries will result in cattle being forwarded when prices improve.

March was the second complete month of operation of the National Mark Beef Scheme in the Leeds, Bradford and Halifax area. The total number of sides graded and marked in this area during the month was 6,254, of which 2,421 sides were graded "Select." The retail traders have made full use of the publicity material supplied by the Ministry, while advertisements in the Press have also contributed to foster the demand of the public for National Mark beef. In introducing the scheme to a new area, some little time must elapse before the public generally becomes aware of its advantages and forms the habit of asking for National Mark beef and looking for the Mark. There are signs that this habit is now being formed in the Yorkshire area, and, in consequence, the demand for National Mark beef has been firmer than for ungraded supplies.

National Mark Strawberries and Cherries.—The Ministry has given consideration to the reports that have been received from its Marketing Officers on the operation of the strawberry and cherry schemes during 1930, and has decided, with the concurrence of the National Mark Fruit Trade Committee, to permit the use of the following standard non-returnable containers in addition to those at present specified under the scheme :—

(1) FOR STRAWBERRIES :—
- (a) *For use in packing "Extra Selected" grade.*
  - (i) "Selmor" No. 1 punnet and No. 2 basket.
  - (ii) "Sealite" No. 1 punnet.
  - (iii) "Climax" No. 2X basket. (This is deeper than the "Climax" No. 2 basket, the use of which is not permitted.)
- (b) *For use in packing "Selected" grade.*
  - (i) "Selmor" Nos. 2, 3 and 4 baskets.
  - (ii) "Climax" Nos. 2X, 3 and 4 baskets.

(2) FOR CHERRIES :—
- (a) *For use in packing "Extra Selected" grade.*
  - (i) Nos. 3 and 4 ordinary chip baskets.
  - (ii) "Selmor" No. 1 punnet and Nos. 2, 3 and 4 baskets.
  - (iii) "Climax" Nos. 2X, 3 and 4 baskets. (The "Climax" No. 2X basket is deeper than the "Climax" No. 2 basket, the use of which is not permitted.)
- (b) *For use in packing "Selected" grade.*
  - (i) "Selmor" No. 1 punnet and Nos. 3 and 4 baskets.
  - (ii) "Climax" Nos. 3 and 4 baskets.

To meet complaints by the railway companies regarding indistinctly addressed National Mark covers and labels, the Ministry has decided that stamping of the consignee's name and town in the space provided on the covers and labels, in black letters of not less than ¼-in. in height, shall be obligatory upon all authorized packers.

National Mark Tomatoes and Cucumbers.—The Ministry has now completed arrangements whereby savings in the cost of National Mark tomato and cucumber labels will be effected. A slight alteration in the method of ordering previously in force will, however, be necessary and, by arrangement with the National Farmers' Union, orders for tomato and cucumber labels will, in future, be dealt with directly by the Ministry.

It is hoped that the reduction in the cost of labels will remove the difficulty, present to some authorized packers, in packing a larger proportion of their produce under the Mark, and the coming season should show a substantial increase in the National Mark output. Supplies are already in evidence on the markets.

With the concurrence of the National Mark Fruit Trade Committee, the Ministry has agreed to a minor amendment of the scheme to permit the optional use of black or green lining paper for National Mark packs of tomatoes, in place of the pink and/or white lining paper previously specified.

National Mark Wheat Flour.—The enrolment of retail firms as authorized re-packers has steadily continued, as the demand for National Mark flour, mainly in rural districts, has made itself felt. The following additional firms have received certificates of authorization :—

The Happy Life Flour Co., Ltd., Warrington, Lancs.
G. P. Hawkins, Ltd., 21 Sidney Street, Cambridge.
E. G. Bastable, Berry Stores, Colyton, Devon.
Palmer & Edwards, 68-69 South Street, Exeter.
Tom Morris, The Fountain Café, 20 Rother Street, Stratford-on-Avon.
C. Dearlove & Son, London Road, Hook, Hants.
F. Finn & Sons, Ltd., 21-24 St. Margaret's Street, Canterbury.
R. Chappell, Hinton St. George, Crewkerne.
City of Bradford Co-operative Society, Ltd., Bradford.

The following additional firms have been enrolled as authorized millers :—

E. H. Bailey, Ltd., Matlock Mills, Matlock.
Green Bros., Rayleigh Flour Mills, Maldon.
Elmer Bros., Anchor Roller Mills, Chelmondiston.

National Mark Malt Products.—Samples of National Mark All-English (Pharmaceutical) Malt Extract with cod-liver oil, consisting of a number of 1-lb. jars purchased from retail chemists, have been analysed at the Government Laboratory and found to comply in all respects with the grade specification, except that one sample showed very slightly more than the standard proportion of cod-liver oil. For comparative purposes, samples were also taken of ordinary packs of malt extract with cod-liver oil. On analysis, these showed wide variations of composition and properties, the Lintner value being as low as 2 in one case and 3 in another, compared with the minimum of 25 for the standardized National Mark product.

National Mark Cider.—The Agricultural Produce (Grading and Marking) (Cider) Regulations, 1931, have been made by the Minister, and the National Mark Cider Scheme is now launched. The Regulations provide for two grades of cider (produced from apples and pears grown in England and Wales) to be packed and sold under the National Mark—viz., *Select Cider* (*Champagne Process*) and *Select Cider*.

The "definitions of quality" prescribed in the original draft Regulations have been slightly modified. The necessity in the case of *Select Cider* (*Champagne Process*) for removal of deposit by the disgorging process has been emphasized. As regards both grades of cider, reference to the specific gravity of the syrup that may be added has been omitted, and it is made clear that the original gravity of the finished product, which may be prepared either from (a) a pure fruit juice or from (b) a pure fruit juice to which not more than 25 per cent. of a syrup made from pure beet or cane sugar has been added, must not be less than 1·040 at 60°F. (Makers of National Mark cider produced only from pure fruit juice to which no syrup has been added will be at liberty to state the fact on their private labels.)

The Regulations follow the draft previously published in requiring National Mark cider to be made from clean and reasonably sound home-grown apples and pears only, to be free from concentrated apple juice or other fruit juices, from artificial bouquets and essences, and from the recognized signs of inferior ciders such as ropiness, sickness and excess of acetic acid.

The Regulations (Statutory Rules and Orders, 1931, No. 168) are obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1d., postage extra.

Certificates of Authorization have now been issued to the approved packers in the list below, the printing and issue of official National Mark labels are proceeding and a number of packers have been authorized to incorporate the National Mark design in their private brand labels. It is anticipated that it will be possible for authorized packers to make deliveries of National Mark cider to distributors by the beginning of May.

NAMES OF AUTHORIZED PACKERS OF NATIONAL MARK CIDER.

Bonner & Durrant, Holmer, Hereford.
J. Boulton & Sons, Ltd., Hereford.
H. P. Bulmer & Co., Ltd., Hereford.
William Burrows, Crediton, Devon.
Carr & Quick, Ltd., Exeter, Crediton and Topsham.
R. N. Coate & Co., Ltd., Nailsea, Somerset.
Dartington Hall, Ltd., Totnes, Devon.
William Evans & Co. (Hereford & Devon), Ltd., Widemarsh, Hereford.
Ferris, Ellis & Co., Dawlish, Devon.
M. B. Foster & Sons, Ltd., Victoria Stores, North Woolwich, London, E. 16.
William Gaymer & Son, Ltd., Attleborough, Norfolk, and London.
Edwin Hill & Son, Ltd., Totnes, Devon.
John F. Hodges & Sons, Dorchester.
Long & Co. (Southsea), Ltd., Southsea, Hampshire.
"Lorna Doone Cider Vintage" (E. H. Wells), Wellington, Somerset.
Mitchell, Toms & Co., Ltd., Chard, Somerset.
The Quantock Vale Cider Co., Ltd., Bridgwater, Somerset.
Ridler & Son, Clehonger, Hereford.
Schweppes Ltd., Hele, Devon; Blakeney, Glos; and Weare, Somerset.
Severn Vale Cider Co., Ltd., Bushley, Glos.
H. & G. Simonds, Ltd., Reading, Paignton, Devonport and London.
Somerset Cider Growers' Federation, Ltd., Glastonbury.
The Taunton Cider Co., Ltd., Norton Fitzwarren, Somerset and Harrow.
Watkins Pomona Cider Co., Wye Bridge, Hereford.
H. Weston & Sons, Much Marcle, Hereford.
Wickwar Cider Co., Ltd., Wickwar, Glos.
S. Willetts, Blakeney, Glos.

National Mark Canned Fruit and Vegetables.—The results of the Ministry's investigations into the possibility of widening the scope of the Scheme, by including therein additional varieties of fruits and vegetables, have been laid before the National Mark Canned Fruit Trade Committee. The Trade Committee has recommended that the following varieties of fruits and vegetables should be packed under the National Mark in and from the season of 1931 :—

DESSERT FRUITS (SYRUP PACKS) :—

Plums (the same varieties as last year, with the addition of the Purple Pershore Plum); Cherries (Napoleon Bigarreau and

Morello); Gooseberries; Strawberries; Loganberries; Blackberries (cultivated varieties); Raspberries; Red Currants (either alone or with Raspberries); Black Currants.

GALLON CANS (SOLID PACK):—
Apples—Bramley's Seedling and Newton Wonder.

VEGETABLES:—
Stringless Beans (whole or sliced); Beetroots (whole); Carrots (whole); Celery (hearts); Onions; Fresh Picked Peas; New Potatoes; Spinach; Turnips (whole); Macedoine of Vegetables.

As hitherto, the "grade designation" for each variety of fruit or vegetable will be the word "Select" coupled with the name of the fruit or vegetable. Definitions of quality have been drawn up and embodied in draft regulations under the Agricultural Produce (Grading and Marking) Act, 1928, the grades for fruit and vegetables respectively being dealt with in separate draft regulations, copies of which can be obtained from H.M. Stationery Office, price 1d.

It is well known that some of the leading canners, including firms who gave strong support to the National Mark Scheme during 1930, have made arrangements to enlarge very considerably the scale of their operations during 1931. It is satisfactory, therefore, to note that the standards set up by the Scheme during its first year of working, although largely of an experimental nature, were well maintained throughout the large aggregate output of the 17 firms enrolled as authorized canners. It is hoped that the revision of the Scheme which is now being effected will give further assistance to the industry, the growth of which in recent years has been striking.

The revision referred to includes, in addition to the extensions mentioned above, proposals and recommendations endorsed by the Trade Committee in connexion with the standardization of sizes of cans, weight of fruit content, use of lacquered cans, and matters affecting the technique of canning. Summaries of the recommendations are as follows:—

Standard Sizes for Cans.—During the first season there was a practical unanimity among authorized canners in the use of A2 and A2½ cans, and it can be assumed that the A10 can is already standard for the gallon pack. A fourth size—the E1—was also popular, and four other sizes were in limited use by individual National Mark canners during the 1930 season. A limited measure of standardization will, therefore, be introduced into the National Mark scheme in 1932 by restricting the application of the National Mark to the four sizes in general use—*viz.*, A10, A2½, A2 and E1—with an

option to individual authorized canners to use a fifth, small size, which is to be the subject of further inquiries by the Ministry.

Weight of Fruit Content.—There was considerable variation of practice among authorized canners in 1930 in the ratio of fruit to syrup in cans. The matter is of some interest to distributors in connexion with the administration, by Local Authorities, of the Weights and Measures Act, 1878, and although many practical difficulties exist in the way of the attainment of standardization in this matter, it is felt that some attempt should be made to tackle the problem. A scale of minimum fruit-content weights and minimum net total-content weights for each size of can, and for each variety of fruit, has therefore been drawn up and forwarded to all authorized canners. The scale is based on careful measurements made with a large number of sample cans at the Campden Research Station. Authorized canners are recommended to use the scale experimentally during the forthcoming season as the basis of factory operation and not as a standard to be declared on labels. Observations of the results obtained will be made at Campden on the season's samples.

Lacquering of Cans.—A great deal of research on this subject has been carried out at the Campden Station, but some aspects require further investigation, which is now proceeding. The large majority of National Mark canners already use lacquered cans. In the case of red and blue fruits and peas and beans, lacquered cans are invariably used; for such produce, the practice will accordingly be made standard in connexion with the National Mark scheme in and from the 1931 season. There is, however, some difference of opinion and practice as regards the necessity for using lacquered cans for fruits with water-insoluble colour, and the Ministry will arrange with the Campden Research Station to give attention to this question in connexion with the further investigations referred to.

Vacuum Space.—The commercial life of canned produce is increased where an adequate vacuum is left in the top of the can. This factor is of special importance in the case of canned products exported to tropical countries. The amount of vacuum can only be controlled by a system of sampling, and a recommendation has accordingly been made to authorized canners that they should arrange to test a percentage of their products with a vacuum tester, with a view to an overhaul of methods where vacua of less than 6 inches are frequent.

Syrup Strengths.—Minimum syrup strengths were prescribed in the scheme in 1930 for each class of fruit. There was, however, considerable variation in the strengths of the syrups used by individual authorized canners, and this appeared to result from the existence of two distinct demands from different sections of the community, one section preferring an extra heavy syrup and the other a less heavy syrup. It is felt that, in the interests of standardization, some indication should be given of the strength of syrup used, and authorized canners have, therefore, been asked to consider as an experiment, for the convenience of the distributing trade and of the public during the coming season, the adoption of the practice of indicating, on the label, by means of the terms "Heavy Syrup" or "Extra Heavy Syrup," the approximate densities of syrups used. For "Heavy," the existing minima are suggested, and for "Extra Heavy," a minimum of 55 per cent. for all types of fruit.

List of Canners.—The list of National Mark canners has been augmented by the enrolment of the following firm:—

Foster Clark, Ltd., Maidstone, Kent.

Publicity for National Mark Produce.—Consideration has been given to the programme of publicity for National Mark products during the present financial year, which commenced on April 1, and it is now possible to indicate broadly the general lines on which this will be arranged.

(a) *National Mark Shopping Weeks,* with a display of National Mark products as the focal point of publicity, and supplementary advertising in the Press and by means of hoarding-posters and omnibus or tram advertisements, will be continued. As stated in last month's Marketing Notes, the Ministry is exhibiting at eleven of the principal agricultural shows during the summer months, and it is hoped to arrange National Mark Weeks at certain of the towns concerned. For hoarding-poster displays, a new 16-sheet poster has been prepared.

(b) *Publicity in the Larger Towns.*—Large cities and towns are not regarded as suitable for National Mark Weeks at the present stage, and in certain of these a more general, and less intensive, type of publicity will be undertaken. It has been decided to continue the advertising of National Mark beef in London, Birmingham, Leeds, Bradford and Halifax, and at the same time to give publicity in these areas to other National Mark products. In London, a contract has been

arranged, covering the whole year, for the use of a number of omnibus sides. During April, National Mark beef, eggs, canned fruit and canned peas were advertised by means of side streamers on omnibuses; from May to September inclusive, beef, eggs and cider will be advertised; and from September to March, beef, canned fruits and canned vegetables, with eggs again taking a share of the spaces in February and March.

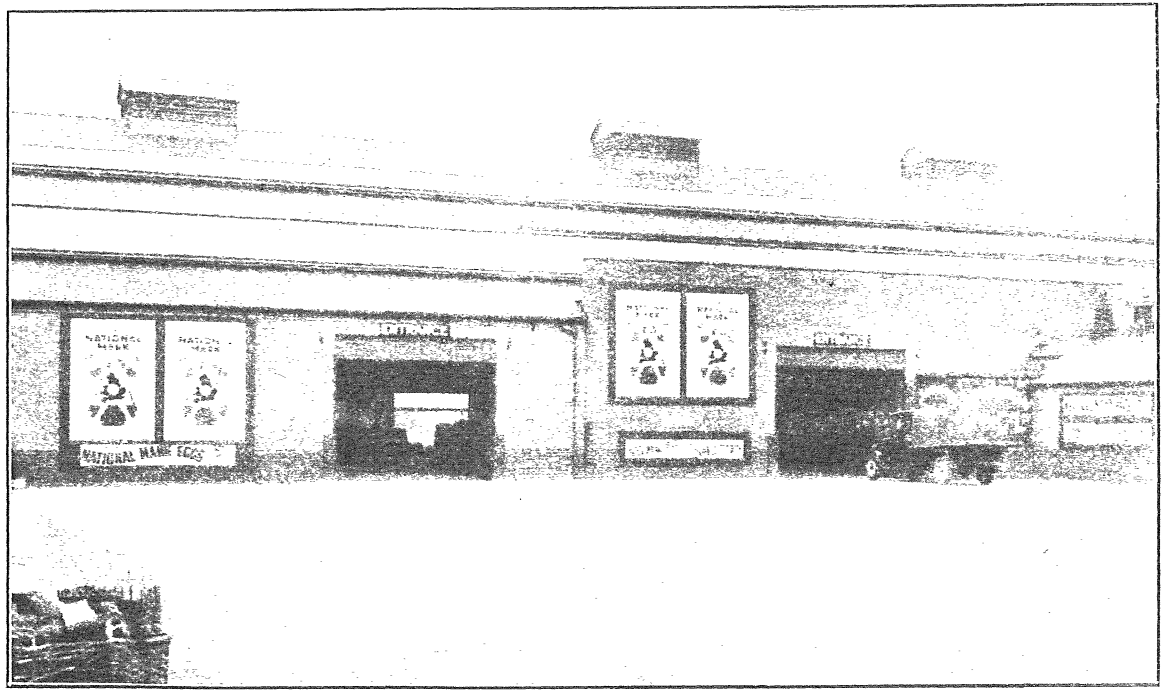
(c) *Empire Marketing Board's Poster Frames.*—Arrangements have been made with the Empire Marketing Board for the lease to the Ministry, for the purposes of advertisements of National Mark products, of all the Board's poster frames in England and Wales for one period of three weeks, and for two other such periods in selected thickly populated areas, with the possibility of a further period in the National Mark beef areas for a special advertisement of that product. The Board's frames will also be used as far as possible in connexion with National Mark Weeks.

(d) *General and Trade Press Advertising.*—It is not proposed to do more than a limited amount of general Press advertising, probably in selected journals for women, but trade Press advertising for particular products will be continued. During April, National Mark fruit was so advertised.

(e) *Display Material and Leaflets.*—An important part of the Ministry's activities in connexion with National Mark publicity is the provision of shop display material for the use of retailers, and of propaganda leaflets for general and special distribution. This service is being continued and will be expanded as opportunity offers.

(f) *Miscellaneous.*—Provision has been made for the production and display of new films dealing with National Mark schemes, for lectures to Women's Institutes and other women's organizations, and for various other activities, including the National Mark Flour Cookery Competition open to Women's Institutes, to which reference has previously been made in these Notes. During April, the following eight County Federations held competitions: Gloucester, East Sussex, West Sussex, Cumberland, Stafford, Cornwall, Salop and Essex.

There is a growing tendency on the part of authorized packers to follow up the Ministry's advertising of National Mark products by arranging publicity on their own account. This publicity has taken various forms, including the use of seals on correspondence, advertisements on omnibuses and



National Mark posters displayed in the Wholesale Market, Derby, during the recent National Mark Week in that town.

MARKETING NOTES.

newspaper advertising. An example of the latter was recently afforded when two columns of an Ipswich daily paper were occupied by advertisements of National Mark flour. The Ministry took half the space with an advertisement headed "Suffolk Flour for Suffolk People," and three firms of millers filled the rest of the space with their own advertisements of National Mark flour.

Another example of co-operation with the Ministry in its efforts to bring National Mark products prominently to the notice of the public is the display of posters by the Derby Corporation at the Wholesale Market and the Cattle Market during the National Mark Week recently held in Derby. The site at the Wholesale Market has been permanently assigned to the Ministry for the advertising of National Mark products; the present display is illustrated facing page 184. This action on the part of a Market Authority is very gratifying and should be of considerable assistance in stimulating the demand for home produce.

Displays of National Mark Produce.—National Mark produce was displayed at the Matlock and District Home and Industry Exhibition, Matlock Bath, from April 15 to 25. During April, three of the principal London stores staged special displays of National Mark Eggs for preserving.

Marketing Demonstration.—A demonstration of egg grading and packing to National Mark standards under practical commercial conditions was arranged in conjunction with National Mark Egg Central, Ltd., at Manchester from March 23 to March 31. The demonstration was given in premises rented for the occasion in this important consuming centre, and aroused much interest among visitors, a large proportion of whom were connected with the distributive trade.

Report on the Marketing of Honey and Beeswax.—Following a survey carried out during 1930, a further addition to the Ministry's Economic Series of reports has now been published in the form of a Report on the Marketing of Honey and Beeswax in England and Wales.*

In this latest orange book the whole range of marketing methods practised in this country, from the hive to the consumer, is described, and valuable comparisons are made with practices abroad.

Like many of its predecessors, the Report emphasizes the

* Report on the Marketing of Honey and Beeswax in England and Wales, Economic Series No. 28. (H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 6*d.* net, post free, 9*d.*)

need for grading and for standardization both of the commodity and of the containers used in the home trade. Organized honey-grading schemes in this country have been rare, localized, and not always successful. The Report extends the horizon from local to national effort and outlines a scheme for the grading and marking of English and Welsh honeys with the National Mark. The establishment of national standards for honey under such a scheme, backed up by large-scale publicity, should stimulate the demand for the home product and facilitate its distribution in the large centres of population where, at present, imported honeys largely hold the field. Besides suggesting grade standards for honey, the Report puts forward specifications for standard wholesale and retail containers for honey—*viz.*, tins, glass jars, section cartons and cardboard cases and trays for both jars and sections.

As is pointed out, however, "standardization of quality is not the only need. . . . Many retailers have difficulty in finding sources of consistent and uniform supply of home-produced honey throughout the season. This is due to the smallness of the average marketing unit and to the tendency of producers, particularly small producers, to unload their honey on the local market immediately after harvest. . . . The development of a marketing system suited to the task of maintaining an orderly flow of home-produced honey to the large consuming centres appears to depend upon collective action by producers." This has been the line along which honey marketing has developed abroad, as can be seen from the Report, which describes the activities of a number of honey producers' associations in New Zealand, Australia, Canada, Germany, Switzerland and the United States. Their functions include the assembly of honey at central stations for grading, blending, packing and bulk transport, advance payments on honey to producers, large-scale publicity and the ensuring to buyers of a reliable and continuous supply. It seems possible that similar functions might be performed by co-operative honey-marketing stations in this country. These need not necessarily be independent units, but might possibly be operated in conjunction with the grading of other agricultural commodities, in particular, eggs.

The consumption of honey and its significance as an agricultural product are much less in Great Britain than in a number of other countries. There is thus vast scope for expansion of production. Such expansion, however, depends largely on the evolution of efficient marketing machinery capable of maintaining the regular flow of uniform produce which is nowadays

required by the distributive trade. As the Report indicates, the eventual solution of the marketing problems of British apiarists may possibly lie in the development of marketing boards, somewhat similar to those in New Zealand and Australia, acting either as trading or regulatory bodies in the interests of all producers.

Germany: Rationalization of Dairies.—In the February, 1931, issue of this JOURNAL (page 1135) there was noted under this heading the opening of a large milk "Centrale" at Nürnberg. One result of the depression that has for so long overshadowed Bavarian agriculture is a realization of the necessity for reorganizing the dairy industry, and this has led to efforts to apply the principles of mass production and centralized selling. Considerable impetus has thus been given to the founding of co-operative associations of both producers and distributors and to the formation of cartels. In the Allgäu, for instance, the Revisionsverband des Milchwirtschaftlichen Vereins (the Dairy Union Control Association) embraces 300 co-operative associations of one kind and another.

Efforts in this direction have extended beyond Bavaria, the amalgamation of the Mecklenburgischer Genossenschaftsverband (the Mecklenburg Co-operative Association) with the Allgäu Revisionsverband having already been agreed to in principle. This fusion is expected to provide the means of creating markets for Bavarian dairy produce in northern Germany.

The co-operative sales organization of the Bavarian "Mark" butter association completed its first half-year's activity on December 31, 1930. The results are considered very satisfactory, 8,574 cwt. of butter, the produce of 50 members, having been disposed of in bulk at a price averaging 9*s.* 4*d.* per cwt. higher than the best Berlin market price.

Queensland: Egg-Pool Proposals.—The first Egg-Pool under the Primary Producers' Organization and Marketing Acts was created in 1923, and applied to all owners of 100 fowls or more in a certain part of eastern Queensland. The pool was extended from time to time, and, in 1926, after a referendum of those concerned, it was made to apply to all owners of 50 or more fowls. The present pool expires in 1933, but, with the consent of a majority of producers, its period may be extended.

The suggestion by the promoters that the scope of the pool should be extended to cover *all* egg producers, irrespective of the number of fowls owned, not being approved, a petition

signed by nearly 200 egg producers was submitted asking that the pool be made applicable to all producers selling eggs from 20 fowls or over, and a notice of intention to create such a pool was in fact issued in August last, but was not proceeded with. The question has been raised again, however, and the Governor in Council has approved the issue of a notice of intention to create a new pool operated by a Board comprising five producers' representatives (one each from five specified districts) and the Director of Marketing or a deputy appointed by the Minister. It is proposed that all eggs produced for sale by producers owning 20 fowls or over within the area shall become the property of the Board. All producers selling eggs will be registered and no merchants permitted to deal in eggs without the Board's approval.

The Board would be empowered to levy ½*d.* per dozen on eggs delivered to it or to its agents; and also to levy ½*d.* per dozen for each of the purposes of :—

(a) establishing an insurance fund;
(b) establishing a reserve;
(c) establishing a fund for any special purpose.

The pool would exist for a period of 10 years, but if a petition is made over the signature of at least 50 egg producers, its institution will be dependent on the result of a poll, a 60 per cent. favourable majority being necessary.

If no such referendum is asked for, the pool will be established by an Order-in-Council.

Ontario : Suggested Registration of Producers and Agents and Institution of an Ontario Mark.—As a result of an inquiry into the marketing problems of the Ontario fruit and vegetable industry, authorized by an Order-in-Council dated September 30 last, Mr. W. B. Somerset, the Commissioner appointed to conduct the inquiry, recommends that all commercial fruit and vegetable growers in Ontario be registered and required to place their registered number on all packages they market, and that all shippers, truckers and commission men be licensed and bonded. Mr. Somerset further advises the establishment of sales promotion offices in Western Canada, the advertising of Ontario produce, seasonal surveys of crop conditions and sales possibilities, Governmental assistance in establishing central packing plants and storage facilities, by-products research, collective purchasing by producers, and the establishment of an Ontario brand or guaranteed quality label. Growers would be required to pay a small levy, possibly assessed at a shilling an acre, the funds so raised to be used in

carrying out these various proposals by a Growers' Marketing Council, the formation of which is recommended.

Canada: A National Mark for Canadian Produce.—The following address was given to the Canadian Horticultural Council at Ottawa on March 12, 1931, by Mr. W. Waldron, Markets Commissioner for Saskatchewan :—

Has the time arrived when a National Mark should be adopted for use in the wholesale and retail trade, both domestic and export, of Canada's products of the farm, orchard and market garden ? A National Mark cannot be used indiscriminately, as, if such were the case, its use would defeat its own ends. A National Mark means exactly what it stands for, namely, a mark that a nation is prepared to stand behind. Such a step cannot, and should not, be undertaken lightly. It is a step carrying responsibility, but it is a progressive step, and progress usually means responsibility for someone. A National Mark is a symbol of quality, and we might ask ourselves if we have arrived at a stage sufficiently advanced in the standardization and grading of our products to warrant the adoption of such a mark, or, if we have not reached that stage, would the adoption of a mark encourage the production of a flow of quality products reaching the necessary standards.

It may be well to see just where we stand. Certain of our products could be carrying a National Mark at the present time. Apples are away to a good start and the higher grades are produced in exportable quantities ; other fruits now sold on grade could also be included ; flour of the required grade could use a National Mark ; wheat, our most important exportable product, unfortunately does not lend itself to the use of a mark, as it enters trade channels in bulk, bulk meaning the car lot, or the vast cargo shot into the hold of a boat. I believe ways and means could be adopted whereby advertising *could* be resorted to for our wheat and a National Mark used in conjunction with such effort.

All Canadian registered *seed* wheat, oats, barley, flax and legumes could bear a National Mark, and it is certain that Canadian certified seed potatoes could carry such a mark, also commercial table stock not below Canada No. 2, as well as onions, celery and turnips. Our superior cheese is surely entitled to the use of a National Mark. Butter is another product which, on the domestic market, might well be advertised under a National Mark, and on markets abroad when we reach an exportable basis. Should a mark be established, it is to be hoped that "Choice" and "Good" beef will be produced in sufficient quantities to warrant the use of the National Mark. The time is not far distant when once again we shall have bacon to offer on markets other than our own, and surely Canadian bacon and hams have already earned a reputation at home and overseas which would entitle that product to bear a National Mark. Wool is a commodity that does not lend itself directly to the use of a National Mark, but, given the opportunity, doubtless wool growers' organizations, in conference with manufacturers, would devise ways and means whereby the mark could be used to promote the sale of the higher staples, or fabrics comprised of *only* high-class staples. Eggs sold under Government grades could use the National Mark, as also could dressed poultry, when grading becomes compulsory. I believe that Dominion Government approved hatcheries might be included so that the mark

could be used on packages of pure-bred baby chicks, and thus add to the value and attractiveness of the packages. Maple syrup and honey will also commend themselves to our consideration.

You will gather from the various specimens of leaflets that I have secured from the British Ministry of Agriculture that a good deal of publicity is also necessary to make the use of the mark a success, and it will be of additional necessity in our case, as it will be very desirable to familiarize consumers, in the overseas markets in which we wish to dispose of our produce, with our National Mark and with the high quality of the products as represented by such mark.

Merely as suggestions I venture to offer, for your approval, three examples of what might be used as a National Mark for Canadian products. These were prepared for me by Mr. Lee-Grayson, an artist of Regina, and he is of the opinion that the scheme would lend itself admirably to various forms of publicity in which posters, cards, stickers and so forth might be used.

The adoption of a National Mark would be decidedly in favour of the producer. At the present time, a great many producers consider grading regulations irksome; it is difficult for them to appreciate the fact that some of their produce cannot be placed in higher grades by reason of lack of quality. The producer desires to be assured that his graded produce will be sold to the consumer on such grades. He wishes to know, for instance, that his Milkfed B poultry will find their way to the ultimate consumer through the intricacies of trade channels, and be sold as Milkfed B poultry, and not under a fancy name which would lead the purchaser to think she was actually buying something superior to Milkfed B. The producer reasons that he is perfectly fair when he asks that the consumer be required to pay a price commensurate with what he, the producer, received for it, plus a reasonable cost for transportation, plus a reasonable charge by the wholesaler and retailer for their part of the transaction. Produce sold under a National Mark with a label of a specified colour signifying the grade will give assurance to the producer and to all those who handle it, but undoubtedly responsibility will be placed with the grader, as grading is the Open Sesame to all the benefits to be derived from the use of the mark.

The opinion is expressed freely in the West that, with the programme of diversification now being undertaken by so many farmers, over-production will result in glutted markets. It is stated that we shall have too many hogs, too many cattle, too many poultry, and too much butter. I think perhaps the fact that we have had too much wheat on our hands on a cataclysmic market has shaken the nerves of some, but can you blame them for asking questions? It is because too few sound economic questions have been asked in the past that so many are being asked now, and both farmers and farm leaders are cautious. However, if a young country such as Canada, with millions of acres of fertile lands yet untouched, needs hesitate to produce more and yet more, our future will be dismal indeed. It is not so much a matter of greater production as it is a matter of producing the right quality, and there is only one watchword to adopt simultaneously with a National Mark, and that is "Quality," and again "Quality," which means scrapping much of our present stock-in-trade, keeping one cow where two were required to give a like volume, one hen where four were required previously, and so on up or down the line.

Some drastic changes are necessary, and the producer is willing to undertake them if someone will convince him that a market will be found if he insists on raising only produce of high degree.

This period of depression is a blessing in disguise—perhaps things were becoming too easy for us, and now the time has come for us to gird up our loins and move as one ought to move in this present century, constantly on the alert for changing conditions and ready to adapt ourselves to them.

Bermuda : A Colonial Mark for Fruit and Vegetables.—The Colony of Bermuda has adopted and registered a colonial mark, consisting of a pink oleander flower and the following words in green, "Bermuda Brand, Winter-Grown." The mark has been incorporated in two types of labels and its use will be restricted to fruit and vegetables packed under direct Government supervision. A staff of five inspectors will be responsible for the proper packing of the products.

A packing shed has been built and equipped with a Cutler tomato grader capable of making three separations for degrees of ripeness, namely, "Green," "Turns" and "Half-Ripes," and, for each of these, four further divisions for size, namely, 40's, 72's, 98's, and 144's. The fruit is packed in 20-lb. lugs.

A motor-driven Bogg's potato and onion grader is also being erected, and these vegetables will also be packed at the station free of cost to farmers in order to demonstrate the value of uniformity in grading and packing.

The Bermuda Department of Agriculture states that it has been prompted to undertake this work as a result of the example of the National Mark schemes in this country. Bermuda is now seeking a market in Canada for her winter-grown vegetables, and the future appears bright.

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NOTES ON SUPPLIES AND PRICES

R. J. THOMPSON, C.B., O.B.E.,
Late Assistant Secretary, Ministry of Agriculture and Fisheries.

PRICES in the second week of April showed no great change as compared with a month earlier, the small fluctuations being often of a temporary character, due briefly to the influence of the Easter markets. Wheat, fat cattle and beef, sheep and mutton all showed a slight improvement. Fat pigs, both baconers and porkers, were cheaper, but pork was unchanged, although Danish bacon was definitely higher. Potatoes, owing to a shortening of supplies, advanced in price, the gain at London being 40*s.* per ton on the month. Wool also improved, while eggs declined with the advance of the season.

The comparative prices ruling a month ago and a year ago are shown in the following table* :—

	Prices early in April, 1931		Prices early in March, 1931		Prices early in April, 1930	
	s.	*d.*	*s.*	*d*	*s.*	*d.*
Wheat, *Gazette* average, per cwt. ..	5	3	5	2	8	7
Fat cattle, 1st quality, per cwt. ..	49	1	48	3	55	0
Beef, English N.M. Prime, per lb. ..	0	8	0	7¾	0	9
,, Argentine Chilled, H.Q., per lb.	0	6⅜	0	6	0	7
Fat sheep, 1st quality, per lb. ..	1	0½	1	0½	1	2¾
Mutton, English, per lb.	0	11¼	0	11	0	11⅞
Lamb, New Zealand, per lb. ..	0	7	0	7¼	0	9¼
Fat pigs, 1st quality baconers, per score	13	8	13	10	18	8
Bacon, Danish, green, per cwt. ..	80	0	70	0	118	0
Fat pigs, 1st quality porkers, per score	16	4	17	1	20	2
Pork, English, per lb.	0	11	0	11	1	1½
Cheese, English Dairy Cheddar, per cwt.	106	0	102	0	118	0
,, New Zealand, per cwt. ..	57	0	62	0	82	6
Eggs, N.M. Standard, per 120 ..	11	0	13	0	12	9
Potatoes, King Edward, Lincs and Yorks, per ton	190	0	150	0	75	0
Wool, Southdown, per lb. at Bradford	1	1½	1	1	1	4½
Maize, Argentine, per cwt... ..	5	0	4	7	7	5

All the commodities shown in the above table, except potatoes, were cheaper in April, 1931, than a year earlier, but the difference is, in some cases, less marked than in the similar comparison given in these notes last month. In the case of wheat, the fall is about 39 per cent., in cattle and beef 11 per cent., sheep 15 per cent., bacon pigs and Danish bacon 27 and 32 per cent., pork pigs and pork 19 per cent., and wool 18 per cent., as against April, 1930.

* The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending April 8, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

As an indication of the average decline in the prices of the principal agricultural commodities, it may be mentioned that the Ministry of Agriculture's index number for March, 1931, was 11½ per cent. below the figure for March, 1930, and 14 per cent. below that for March, 1929. Feeding stuffs were rather dearer in March last as compared with the preceding February, but were 16 per cent. below March, 1930, and no less than 43 per cent. below March, 1929.

Wheat.—Since last month's summary of the wheat position was written, the general situation has shown little change. The abnormal surpluses available in exporting countries remain the dominant factor. Prices in the world's market after fluctuating slightly downwards subsequently recovered and were rather firmer in the middle of April; the Liverpool May future, for example, stood at 4*s.* 4¾*d.* per 100 lb. on April 14, as compared with 4*s.* 3*d.* a month earlier.

In the United States, the Federal Farm Board has announced that it will cease buying wheat after the end of the present season, so that the arrangement whereby American growers, since November last, have been receiving 20 to 25 cents per bushel above the world price will come to an end in June. The Board has given no indication of the steps it will take to dispose of the huge stocks remaining in its hands, but it seems probable that it will for the present only attempt to sell small quantities in directions where it can do so without appreciably disturbing prices, and will be content to hold its main stocks for some considerable period in the expectation that conditions will ultimately improve. The official statement is that the stocks "will be handled in such a way as to impose the minimum of burden upon domestic and world prices."

The demand for wheat has been well maintained during the past month, and the total shipments of wheat and flour to all destinations during the present season (August 1, 1930, to April 11, 1931), as calculated by the *Corn Trade News*, amount to 67,229,000 qr., as compared with 54,021,000 qr. in the previous corresponding period. Australia has made some considerable shipments to China, and the more settled condition of the latter country affords hope that it may continue to absorb a portion of the surplus supply and thus relieve the pressure on the European market. The low value of silver, however, restricts the demand in the East generally. Milling quotas and high tariffs continue to limit the purchases of imported wheat by Continental countries, but Germany, at the beginning of April, raised the proportion of foreign wheat which

millers are allowed to use in their grist from 35 to 50 per cent., and France, similarly, increased its percentage from 10 to 20 per cent. An increase in buying may be anticipated in consequence, though the import duties are extremely high. Holland, on the other hand, has introduced restrictions intended to encourage the consumption of domestic wheat, and this will have the effect of reducing importation somewhat. There are now 10 European countries which have legislation of this character. A restrictive duty has also been imposed in India. The total importation into Europe (including the U.K.) this season has been about 52 mill. qr., as against 41½ mill. qr. and 62¾ mill. qr. in the corresponding periods of 1929-30 and 1928-29.

As regards the next harvest, the United States showed a reduction on its winter wheat area of about 1½ per cent., but according to the statement issued by the Crop Reporting Bureau on April 9, the condition of the growing crop indicated a production of 644 million bushels as against 604 million bushels harvested last year. Estimates of the spring sowings are not yet available, but the Department of Agriculture reports that farmers intend to plant about 15 per cent. less than last year, a reduction of nearly three million acres. An unofficial estimate for Canada suggests a reduction of over two million acres, while the Roumanian wheat area shows a reduction of 11 per cent. It is too early for reliable information to be available as regards the Southern Hemisphere, but preparations for the new crop in Australia are reported to indicate that the area will be appreciably reduced, while the Minister of Agriculture in Argentina has advised wheat growers to decrease their sowings by 10 per cent. Among the large importing countries, Germany shows an increase in wheat acreage of nearly 7 per cent. and Italy of about 1 per cent. No definite particulars are available as regards France, but weather conditions have been unfavourable, and a reduction in area is anticipated. No new information is available as regards Russia, but an increase in area is practically certain. On the whole, present indications suggest that the next harvest will be reaped from a reduced area in the principal exporting countries, except Russia, while European importing countries may not in the aggregate show much change.

Cattle and Beef.—Prices of fat cattle, which are usually at their highest from April to June, have so far shown very little upward movement, and are decidedly below the level of the

past two years, the average quotation for first quality cattle in the week ending April 1 being 49*s*. 1*d*. per live cwt. as compared with 55*s*. and 54*s*. 4*d*. at the corresponding date in 1930 and 1929. Current quotations are in fact lower for the time of year than for some years past, the nearest approach being in 1927 when the usual spring rise was delayed by heavy importations of chilled meat. The markets this year do not seem to be over-supplied and an explanation of the lack of recovery in prices must be looked for in other directions.

Prices in 1930, after reaching their highest point in April gradually declined till October-November, the average for first quality in the latter month being about 48*s*. 3*d*. per live cwt. Falling prices are characteristic of the autumn fat cattle markets, and rates in October and November last year were only a shilling or two less than in the two preceding years. This seasonal decline is attributable partly to the larger supplies of fat cattle which come on the market at that time of year, but, in the main, to the fact that many of the beasts lack finish—a feature which was frequently referred to in the market reports last autumn. The autumn and spring prices are, in fact, not entirely comparable, as the finish of first quality beasts in the autumn do not yield so high a percentage of dead weight as the first quality animals in the spring; so that after November, as finish begins to improve, prices should move upwards until a maximum is again reached in April-June. This season, however, prices up to the second week of April showed very little alteration. The same general tendency is noticeable in beef. National Mark Prime beef, which throughout the first eight months of 1930 at London, ranged from 8½*d*. to 9½*d*., declined by the end of October to 7¾*d*., and since then has moved within the narrow limits of 7½*d*. to 8¼*d*. Best Argentine chilled, which is the principal competitor of English beef, showed a very similar movement, but the fall was much more pronounced this spring.

This decline in cattle and beef prices seems to be due, in part at any rate, to the low prices ruling for other descriptions of meat. Sheep, mutton, New Zealand lamb, pigs, bacon and pork are all depressed, and the prices of interchangeable commodities such as the different kinds of meat necessarily influence one another. If mutton, for example, were unduly cheap relatively to beef, there would soon be a lessening in demand for the latter, which would bring down prices to a normal ratio. It may be also that the increase in unemployment since last autumn is reducing the demand for beef, or at any rate for the better grades, while general monetary causes, which affect

prices in general, account for some part of the decline as with other commodities.

Apart from the supplies of cattle from home sources and from Ireland, the supply of imported chilled meat is the most important factor with which the producer has to reckon. Imports of chilled beef come entirely from South America, Argentina in 1930 supplying 85 per cent. of the total and Uruguay about 9½ per cent., the remainder coming from Brazil. The receipts have been as follows :—

	Total for twelve months.	Three months Jan.-Mar.
	cwt.	cwt.
1928	9,565,000	2,591,000
1929	9,305,000	2,478,000
1930	9,093,000	2,220,000
1931	—	2,340,000

It will be seen that the trade has shown some decline, and this is entirely due to diminished shipments from Argentina, both Uruguay and Brazil recording an increase. A census of the number of cattle in Argentina in July, 1930, gave a figure of 32,212,000 against 37,065,000 in December, 1922, but as these returns are only taken at long intervals it is not known whether cattle are increasing or decreasing at the present time, though the number slaughtered at the freezing works has fallen off materially from the 3,234,000 recorded in 1927 (the year of the so-called meat war) to 2,679,000 in 1930. There is little information as to supplies in Uruguay, but the numbers killed rose from 880,000 in 1929 to 1,108,000 in 1930. Practically the whole of the chilled meat produced is exported to Great Britain, while frozen beef is exported both to this country and to the Continent. This latter trade is, however, checked by import restrictions in several countries, and the shipments to the Continent from Argentina and Uruguay in the first 14 weeks of this year have only been 358,000 quarters as against 508,000 in the same period last year. The shipments of chilled beef to the United Kingdom for the same period amounted to 1,654,000 quarters, as against 1,657,000 last year, and the quantities afloat are about normal. The killings at the freezing works so far recorded are lighter. On present indications, therefore, the supply of chilled meat from South America in the near future appears likely to be moderate, and it is possible that some recovery in cattle and beef prices may take place in May or June.

It was thought at one time that the United States might become a substantial buyer of meat in Argentina and thus reduce the supplies available for this country. The position

has since changed, as in June, 1930, a higher tariff was imposed and imports into the United States have, in consequence, declined to small dimensions. The number of cattle in the United States has, moreover, been increasing since 1928, while the demand for beef has decreased, apparently as a result of the unfavourable economic situation. The new tariff has also had the effect of reducing the imports of live cattle into the United States from Mexico and Canada, and the total received in the six months July to December, 1930 (*i.e.*, following the imposition of the higher duties), fell to 33,000 as compared with 220,000 in the corresponding period of 1929. The stoppage of this outlet for Canadian cattle may tend to increase exports from Canada to this country, though the numbers actually arriving during the past autumn only amounted to about 3,000 head.

Sheep, Mutton and Wool.—The number of sheep on offer at representative markets in recent weeks has been rather below the average for the time of year, but, with a quiet demand, prices showed little variation, the average per first quality being about 1*s.* 0¼*d.* per lb. dressed carcass weight. As pointed out last month, the current low price, which is about 2¼*d.* below that ruling in the corresponding periods of 1929 and 1930, is largely due to the heavy arrivals of frozen lamb from Australia, New Zealand and South America. The receipts for March continued to be on the high side, and the total for the first three months of 1931 amounted to 4,370,000 lamb carcasses as compared with 3,131,000 in the same period of 1930.

The shipments afloat on April 13 and due to arrive in April or May represented 2,190,000 carcasses as compared with 1,834,000 carcasses a month earlier. About 65 per cent. of this prospective supply is from New Zealand. The stocks of lamb in store or loaded on steamer in New Zealand at the end of March were, however, lower at 1,787,000 carcasses as against 1,839,000 at the corresponding date in 1930. Killings during March were also lighter, so that a reduction in shipments is probable. The heavy quantities received and in sight exercised a further depressing effect on the market, and wholesale prices weakened slightly during the month, New Zealand Canterbury lamb falling from 6¾*d.* to 6⅝*d.* and Australian from 5*d.* to 4⅞*d.*, though Argentine lamb maintained its price unchanged at 5*d.*; thus New Zealand lamb has fallen by 25 per cent. since the beginning of January, and other sorts even more.

The improvement in wool prices indicated last month has

been maintained, and the Bradford price of Southdown wool (1*s.* 1½*d.* per lb.) represents a gain of ½*d.* a lb. as against a month earlier.

Pigs, Pork and Bacon.—As in the case of cattle and sheep, prices for fat pigs this spring have not shown the upward movement which usually occurs at this season of the year, values for both porkers and baconers showing little variation from those prevailing in the autumn, so that comparison with last year's spring prices makes an unfavourable showing. Rates for pork pigs and for fresh pork were exceptionally high in the early months of 1930, the maximum for first quality porkers being reached in February when an average of 22*s.* 9*d.* per score for the month was recorded, while English and Irish fresh pork was making about 1*s.* 2½*d.* per lb. wholesale in London. Prices declined with the seasonal falling off in demand in the summer, and in October porkers averaged about 17*s.* 3*d.* per score. A small improvement took place in November and December, but prices subsequently weakened and in the second week in April the average was 16*s.* 4*d.* per score, while fresh pork was correspondingly cheaper at 10½*d.*-11*d.* per lb.

No definite figures are available of the supplies which enter the market for the pork trade, although the number of fat pigs shown at certain markets, and the number imported from Ireland, have both been somewhat larger during the past three months than in the same periods of 1929 and 1930. These include animals sold for bacon, but the prices ruling for bacon pigs have probably tended to encourage a larger supply of porkers.

The heavy and exceptional imports of bacon which began to increase in volume in the spring of 1930 are evidently the principal factor in the downward movement of pig prices. During the six months, October, 1930 to March, 1931, these amounted to 5,205,000 cwt. as against 4,158,000 cwt. in the previous corresponding period, an increase of 25 per cent. Of this total, 3,690,000 cwt., or 70 per cent., came from Denmark, and the London price of Danish bacon (first quality green) fell from 118*s.* per cwt. in April, 1930, to 74*s.*-86*s.* in April, 1931, with a minimum of 60*s.* at the end of February. At these low prices, consumption was evidently much stimulated and the market found no difficulty in disposing of the large supplies available. Best English Wiltshire did not decline to the same extent, as it enjoys a special market, but taking first and second quality Irish as an average, the mean fall in bacon prices between March, 1930, and March, 1931, may be put at 32 per cent. The

average drop in the price of first-quality bacon pigs was about the same.

As regards the probable trend of future bacon supplies, the heavy exports from Denmark, which have been particularly noticeable since the middle of 1930, are the consequence of the great increase in the pig population of that country, which rose from 3,616,000 in July, 1929, to 4,920,000 in July, 1930. and then to 5,232,000 in January, 1931. At the latter date, however, the number of young pigs under two months and of breeding sows showed some small decline, and this may indicate a relaxation of the recent rapid increase. In the first thirteen weeks of this year, the weekly killings have averaged 122,000 as compared with about 91,000 in the similar period in 1930. The number was reduced to 100,000 in the week ended April 8 last, and it is noteworthy that this check coincided with a rise of 10*s*. per cwt. in the price of Danish bacon between the middle of March and the middle of April. Exports are likely to continue on a substantial scale for the present.

Holland is the next most important source of bacon to this country, and its pig population was estimated to have shown an increase of 10 to 15 per cent. in September last compared with a year earlier. Sweden is sending larger quantities and here the pig population has increased by 28 per cent. Poland is another considerable exporter, and increased its stock of pigs, as between June, 1929, and June, 1930, by 25 per cent. In Germany the rise in the same period was 18 per cent. and there has been a further substantial increase since then.

This development in the Continental pig population is attributable to the low prices ruling for feeding stuffs during the past year or so. These low prices have made it profitable to supplement supplies of home-grown fodder by cheap grain from abroad, and thus increase the production of pig meat either for home consumption or for export. Denmark, for example, increased her imports of barley, maize and other grain in the first eleven months of 1930 to no less than 15,700,000 cwt., as compared with 4,700,000 cwt. in the corresponding period of 1929. These imports consisted largely of barley from Russia, maize from Argentina, and rye from Germany.

The maintenance of bacon exports to this country at anything like the recent rate depends on the future trend of feeding stuff prices in relation to bacon prices in this country. As regards the latter, it has to be remembered that in the spring of 1928, when feeding stuffs were much higher, Danish bacon was sold at 85*s*. 6*d*. per cwt., so that while the rates of 70*s*. and less which have recently been ruling may have been un-

profitable, the present prices of feeding stuffs may easily allow Danish bacon to be sold without loss at the figure of 80*s.*, at which it stood in the middle of April last.

As regards feeding stuffs, there is every prospect of a continuance of low prices for maize, as the new Argentine crop (reaped in March-April) is expected to prove one of the largest on record, though no official estimates are yet available. The new crop will not begin to move in quantity till May-June, and in the meantime the market is being supplied from the previous crop, the stocks of which are quite small. The trend of prices can, however, be judged from the fact that "parcels," for May-June shipment were being quoted at Liverpool at 16*s.* per 480 lb. as compared with about 26*s.* a year ago and 37s. a year earlier. Current quotations for Argentine maize, ex London mill or store in the second week of April, were 21*s.* 6*d.* per 480 lb. as against 31*s.* 9*d.* in April, 1930, and 42*s.* 9*d.* in April, 1929. Cheap maize appears to be a practical certainty for some time to come. This will tend to keep down barley and other feeding grain, while the low price of wheat ensures correspondingly low prices for wheat offals.

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MAY ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
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Hay Crops.—In short rotations on arable land, the hay crop may be pure clovers or a mixture of clovers and rye-grasses; in any case, the clovers should contribute substantially to the bulk and feeding value of the hay as well as influencing the manurial residues which will be available for future crops. In no small measure, the success of the whole rotation is dependent on the success of the clover crop. Fields on which clovers do not grow well should be specially noted; in some instances lack of potash may be the cause, but, in many others, especially where the growth is patchy or irregular, it is more than likely that the prime cause is a shortage of lime. Wide differences in lime content can occur in the same field, and soil tests will often reveal distinct lime shortage in places where the clover has failed, and no apparent shortage where the clover succeeds. In such cases the clover plant acts as a good indicator of the extent of the lime shortage. Clovers, especially broad red clovers, may fail from other causes and clover sickness and clover-sick land are well known to the farmer. The so-called clover-sickness may be observed in the autumn after

the corn harvest, when the foliage becomes discoloured and the leaf stalks become rotten and collapse, the decay or rot ultimately penetrating to the tap root. The decaying roots are infested with minute eelworms and the two evils appear to work together. Treatment is not very satisfactory, but consolidation of the ground in autumn is beneficial and, when growth is abundant, feeding the crop to sheep will allow a better circulation of air while the treading of the sheep will do good. A dressing of ground lime in winter is also beneficial, but the wisest precaution, perhaps, is to lengthen the period before red clover is again sown or to include Alsike and White Clover, which are less susceptible to the disease. Light land and land naturally deficient in lime are most liable to clover sickness. The manurial residues after the clover crop derive mainly from the root residue ; strong deep roots well developed by the growth of two hay crops give better residues than where the crop has been fed off.

Temporary leys, with a life of three or four years, are an important source of hay. Such leys should have been specially manured and should not be cut for hay more than once in a season ; cutting should be early in order to get as leafy a hay as possible and also to ensure a better aftermath and valuable autumn grazing.

In many cases, leys intended for permanent grass will also be mown for hay. Opinions differ as to the merits of mowing or grazing, especially in the first year. The nature of the soil, the seeds mixture used and the class of stock available for feeding the grass will influence the decision. Heavy clay soils may be better mown once in the first year, whereas light soils may benefit more from being fed off by cattle ; sheep should be used with caution and the feeding should not be too close. The main consideration is not to be too severe on a young pasture ; a heavy crop of hay or very close grazing in the first year causes injury.

On grass farms the hay must be made from old-established pastures and, provided they are properly manured and cut at the proper time, very good quality hay, full of fine grasses and clovers, can be obtained. The most common mistake is cutting the permanent grass meadows too late ; where the farm is a mixed one, the seeds hay will require to be made first. This often throws the meadows rather late and a common practice is to take the mowing meadows in the same order each year. Some meadows are naturally later than others, but too often they are late and poor because of the repeated late mowing:

frequently they are full of weeds which are allowed to seed themselves each year. Yellow Rattle, a parasitic weed common on poor meadows mown late in the season, can be successfully combated by early mowing before the plant has developed its seeds. This is only one of the advantages of changing the sequence of mowing from year to year, from which an all-round improvement in quality may be expected.

Sugar-Beet.—Wherever sugar-beet has been grown in any appreciable amount, the County Agricultural Education Authorities and the Beet-Sugar Factories Committees have carried out experiments and demonstrations. Full advantage should be taken of the information thus obtained. Much of it has almost universal importance, but the County Agricultural Organizers will be able to advise on individual conditions. A most important factor is regularity of plant, which can only be obtained by a full plant in the first instance and by competent singling and avoidance of loss in hoeing. The average crop of 8¾ tons per acre in 1930 is still too low. The example of continental growers is held before the English farmer, who is asked to get per acre an average crop of 12 tons with 40,000 plants. Increased yields per acre would appear to be one way of meeting the lower price, and the number of plants per acre is a vital point.

Mangolds, swedes and turnips, with which the English farmer is well acquainted, respond to comparatively wide spacing and grow larger individual plants; but sugar-beet reacts less to space and the size of the individual plant is influenced mainly by the inherent quality of the soil, manuring, cultivation and freedom from weeds.

It is important to determine, for each class of land and variety of sugar-beet, what is the spacing which will give the largest yield per acre without unduly increasing the cost of cultivation. It is probable that this will be somewhere about 9 or 10 in. in the row, and obtaining a full crop will depend to a considerable extent upon getting an average spacing of about this interval. It is of prime importance to procure seed of high germinating capacity and to sow it thickly. The amount of seed advocated is 15 lb. per acre as a minimum where 18-inch rows are used, but larger amounts up to 20 or 25 lb. of seed are used per acre on the continent. The smaller amount may be more than ample when circumstances are all favourable, but adverse conditions must be borne in mind and seed is comparatively cheap when the financial advantage of getting a full plant is considered. A full plant is only part of the problem.

Singling in this country is very often done at piecework rates, but, unless combined with a bonus, the very best results may not be obtained. During the past season, the writer made a check over three acres of beet. The plant was satisfactory, with an occasional thinning out due to wireworm attack, but there were very few actual blank spaces. The workers were instructed to single out at distances of from 7 to 9 in. and to use their judgment in order to save the strongest plants. The work was apparently well done and would have satisfied most growers, and it was not until actual counts were made that the true situation was revealed. On the first acre the average distance apart was 10·3 in.; on the second acre, 10·5 in.; and on the third acre, 11 in. The result was that the average number of plants per acre was 32,700, whereas if an average distance of 9 in. had been obtained there would have been 38,700. The average weight of the washed and tared beet was 16½ oz. each, so that a further 6,000 beets might have raised the yield from 15 tons 1 cwt. to 17 tons 16 cwt. and, as the average sugar content was 18·6 per cent., the gross value would have been increased from £40 0*s.* 3*d.* per acre to £47 14*s.* 3*d.*

Insect Pests.—A catalogue of the insect enemies of the farmer would be formidable. Fortunately, not all cause widespread damage, yet the total loss each year is considerable. The fruit farmer has a spraying programme which should be part of his regular routine work. The general farmer adopts less specific means, but, nevertheless, many of his acts of cultivation are designed to minimise the attacks of insects. Early sowing of spring oats to avoid damage by frit fly, and the consolidation of land to make it more difficult for wireworm to move freely from plant to plant, are common examples. At this season of the year, widespread damage may be done by wireworm, leatherjackets and the turnip flea beetle. These are well-known pests and their life histories have been carefully studied, yet absolutely certain methods of preventing attacks by any of them have not been devised. Good cultivation, good drainage and freedom from weeds, together with adequate manuring—in short, good farming—are the main preventive methods. In some years, attacks of a particular pest are more widespread and more devastating than in others, *e.g.*, the attacks of the turnip flea beetle in 1930. In a pest year, all ordinary precautions seem to fail although they may lessen the severity of the attack. Extra ploughings or cultivations and proper consolidation of the soil will do much to reduce wireworm damage;

poultry and birds consume large numbers and the protection of the lapwing is to be commended because of its usefulness in this direction. Leatherjackets can be destroyed by using a mixture of Paris Green and moistened bran scattered over the growing crop. Stimulating the growing crop by quick-acting nitrogenous manures is advisable. Remedies against the turnip flea beetle are numerous, but all seem to have failed in 1930. The most common precaution is to moisten the seed with paraffin or turpentine. When the flea makes its appearance various things are tried. Dusting with basic slag, soot or lime fails as often as it succeeds; running a frame on wheels from which is slung freshly tarred sacks will catch millions; free use of the horse hoe will disturb the fleas, encourage the growth of the plant and is thus beneficial, but there are instances where all these have been tried and still the crop had to be ploughed up. One method by which it is alleged that an attack can be prevented is to sow common turnips around the outsides and headlands of the field, where the kale, swedes or turnips are to be sown, about 10 or 12 days before it is intended to sow the main crop, and when the flea is busy on these turnips to plough them in and sow the crop. The theory is that the first brood is destroyed and that the main crop can be got past the dangerous stage before the second brood is due. A few isolated cases of success with this method may not be proof that the practice is sound, but some support is given to it by the experience of farmers in 1930. It was observed that those who made an early decision to plough up their first crop when the attack was bad had much better success with their second sowing than those who waited an extra week in the hope that the crop would pull through.

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NOTES ON MANURES

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Nitrogen on Sugar Beet.—For most of our crops, nitrogenous fertilizers can best be depended upon to give satisfactory increases in yield over a wide range of conditions. This is no doubt because, of the three common nutrients, nitrogen is the one which is most liable to loss from cultivated soils, for it may be washed out as nitrate in the drainage water or fixed in a temporarily unavailable form by the addition of fresh organic matter to the soil. The most conspicuous effect of nitrogenous fertilizers is on the vegetative part of the plant, the straw of cereals and the leaves of root crops. In examining the effect

of nitrogen on the sugar-beet crop this fact is always prominent; in some cases it may even be the only effect, but this is exceptional. It may be of interest to collect some of the evidence with regard to the influence of nitrogenous fertilizers on sugar-beet, for it is not yet too late to avail ourselves of these fertilizers during the present season. Moreover, with the lower price now prevailing for sugar-beet it is more than ever necessary that those who are growing the crop should aim at the maximum yield.

As far as the form of nitrogen is concerned, all forms when used in accordance with their special properties have given satisfactory results. In general, cyanamide should be given well before sowing, and sulphate of ammonia in the seed bed, whereas the various nitrates or ammonia-nitrate mixtures may be given as early top dressings. Late top-dressing, say after mid-June, is not recommended with any form of nitrogen, for it tends to keep the plants long in active growth and delays maturity. The idea of early application of nitrogenous fertilizers to sugar beet has been gaining ground in this country. In the continental beet-growing districts, where on the whole the rainfall is rather lower than it is here, ammoniacal, and also nitric, nitrogen is frequently applied before sowing, and there are experiments on record here which point to the benefit of seed-bed applications over top-dressings. The beet is a deep-rooting plant and can no doubt follow the nitrate down to considerable depths in the subsoil, thus gaining greater command over the moisture supply.

Where sugar-beet crops are to be grown in districts of heavy rainfall, as in the west of England, there is reason to reserve the nitrates for top dressings. In the drier areas and in years of drought the nitrates seem to be rather more effective than ammonium salts, but this possible superiority is not found in wetter areas. Nitrate of soda, however, may have a special value where no other compound of soda occurs in the artificial mixture used, for beets, like mangolds, respond to additions of sodium salts. This is especially the case when potash also is in small supply.

A very extensive series of trials with top dressings of nitrate of soda have been carried out in Ireland. Several varieties of sugar-beet were grown at each centre, and all plots received 4 cwt. of superphosphate, 4 cwt. of kainit, and 1 cwt. of sulphate of ammonia per acre before sowing. Half of each plot was top-dressed with 1 cwt. of nitrate of soda per acre after singling. Averaging the varieties the results were :—

Year	*No. of centres*	*Without nitrate of soda :* Roots Tons	Sugar per cent.	*With nitrate of soda :* Roots Tons	Sugar per cent.	*Increase for 1 cwt. nitrate of soda :* Roots cwt.	Sugar per cent.
1925	163	9·95	17·60	10·41	17·55	9	0·05
1926	67	11·81	17·25	12·09	17·07	6	0·18
1927	84	10·58	17·53	11·06	17·40	10	0·13

In the humid climate of Ireland with dung and a basal dressing of sulphate of ammonia the increase in roots was not large, and there was a slight tendency to reduce the sugar percentage. (No doubt there was a marked increase in tops, but this is not recorded). The value of the top dressing in pushing the plant on during attacks of insect pests was noted.

In our climate recent replicated experiments with various nitrogenous fertilizers on sugar beet carried out at colleges and on private farms have given somewhat similar but slightly more favourable results in the roots, but large increases in tops are recorded. Taking all forms of nitrogen together and reducing the quantities to the basis of 23 lb. of nitrogen per acre (*i.e.*, 1 cwt. sulphate of ammonia equivalent) the figures work out as follows :—

AVERAGE EFFECT OF 23 LB. N. ON SUGAR-BEET, 1929-30
MEAN OF 17 COMPARISONS

Without nitrogen Roots tons	Tops tons	Sugar per cent.	*Increase for 23 lb. N.* Roots cwt.	Tops cwt.	Sugar per cent.
9·66	11·29	17·89	12	24	−0·05

Now that the feeding value of beet tops is being more appreciated the extra ton or so of leaves per acre makes a really valuable addition to the early winter keep and this, as well as the gain in roots, should be put to the credit of the nitrogenous fertilizers. In the matter of the scale of nitrogenous dressing for sugar beet, 2 cwt. of sulphate of ammonia or its equivalent is a moderate allowance even when dung has been given. If half of this has been applied with the seed the remainder may well go on top. Where the soil is poor or no dung has been used these quantities may be increased by one half. The rich fenland soils form a class by themselves and receive as a rule either no nitrogen at all, or quite light dressings.

See also article on p. 162.

Ammonia and Nitrates.—The farm-made mixture of nitrate of soda with sulphate of ammonia for top-dressing purposes has been in use for many years. The idea underlying this has found expression again in a series of modern fertilizers containing nitrogen in the ammoniacal and nitric forms. In England we have nitro-chalk (15½ per cent. N.), half nitrate and half ammonia, based on ammonium nitrate and sent out in

mixture with chalk. Leunasalpeter, containing 26 per cent. N., derived partly from ammonium nitrate and partly from sulphate of ammonia, has been in use on the Continent for some years. One quarter of the total nitrogen is in this case in the nitrate form. France produces similar fertilizers; Ammonitre 15½ per cent. N., and Nitrammo 20 per cent. N., each have half their nitrogen in the nitric form and the remainder as ammonia. Manures such as these have certain valuable features either for seed-bed application or for top-dressings, for should the weather turn out unusually wet following application the ammoniacal nitrogen will at any rate withstand loss, whereas should conditions be abnormally cold or dry there will be some nitrate present for immediate action.

Manures for Swedes.—There is more variation in the method of manuring swedes than is found in the treatment of mangolds, sugar beet or potatoes. The last-named crops are recognized as being very dependent upon a good supply of plant food, and this is reflected in the quantity of the three common nutrients which they remove from the soil.

The main requirements of swedes on ordinary soils is phosphate, and this is particularly so when no dung is given. Indeed, when farmyard manure is used generously little else need be added unless the local climate permits of crops of 15 tons or more per acre. Dung, however, can usually be better employed for potatoes or sugar-beet, and swedes may still be grown successfully on artificials.

It was on the swede crop that the striking effect of water-soluble phosphoric acid (superphosphate) was first observed at Rothamsted. A ready supply of phosphate hastens the plant in its early stages and greatly increases the final yield. Superphosphate, although very commonly used, is not the only type of phosphate fertilizer that will produce this result. A high-soluble basic slag may be employed, and cases are on record in which, in districts of high rainfall, finely ground phosphate rock has been quite successful. In the normal course of events, and in default of local knowledge as to the action of the less-soluble phosphates, one or other of the first two forms will be used. It is customary, though not necessary, to give a fairly liberal dose of phosphate to the swedes, the residues being relied on for the following crop of grain; if a lighter dressing is applied to the swedes, the barley will usually benefit from a further dressing of 2 cwt. of phosphatic fertilizer. The nitrogen factor is also important. Although soils recently dunged, or otherwise in high condition, may be able to supply enough

nitrate during the long and rather late growing-period of the crop, one or even two hundredweight of nitrogenous fertilizer is quite in order where these conditions do not apply. Potash is seldom required in quantity except on light soils on which no dung has been given.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended April 15				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	10 0*d*	10 0*d*	10 0*d*	10 0*d*	12 11
Nitro-chalk (N. 15½%) ..	9 7*d*	9 7*d*	9 7*d*	9 7*d*	12 1
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	9 10*d*	9 10*d*	9 10*d*	9 10*d*	9 3
Calcium cyanamide (N. 20·6%)	8 18*e*	8 18*e*	8 18*e*	8 18*e*	8 8
Kainit (Pot. 14%)	3 8*a*	2 19*a*	2 19*a*	3 3*a*	4 6
Potash salts (Pot. 30%) ..	5 6*a*	4 18*a*	5 0*a*	4 19*a*	3 4
,, (Pot. 20%) ..	3 17*a*	3 9*a*	3 8*a*	3 12*a*	3 7
Muriate of potash (Pot. 50%)	9 17*a*	9 3*a*	9 2*a*	9 5*a*	3 8
Sulphate,, ,, (Pot. 48%)	11 19*a*	11 6*a*	11 5*a*	11 5*a*	4 8
Basic slag (P.A. 15¾%)‖ ..	2 13*c*	2 3*c*	..	2 9*c*	3 1
,, (P.A. 14%)‖ ..	2 7*c*	1 16*c*	1 16*c*	2 3*c*	3 2
,, (P.A. 11%)‖ ..	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	3 11	..	3 9	3 1	3 10
,, (S.P.A.13¾%)	3 5	2 17	3 3	2 15	4 0
Bone meal (N.3¾%, P.A.20½%)	8 15	7 10	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	5 19*b*	5 5*f*	6 0	4 15	..
Burnt lump lime	1 5*l*	1 2*m*	1 9	1 17*h*	..
Ground lime	1 12*l*	1 8*m*	..	1 12*h*	..
,, limestone	1 3*l*	1 6*g*	1 7*k*	..	..
,, chalk	..	1 6*g*	..	1 11*h*	..
Slaked lime	..	..	2 9	2 17*h*	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid; S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, for delivery during the month, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85%, through standard sieve.

a Prices for 4-ton lots f.o.r. At London, the prices shown are f.o.r. on Northern rails; Southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g F.o.r. Knottingley. Ground limestone 100% through standard sieve.

h Carriage paid 6-ton lots London, bags included.

k In bags, f.o.r. Liverpool. Fineness 45% through standard sieve.

l Carriage paid 6-ton lots Bristol.

m Carriage paid 6-ton lots Knottingley.

For swedes without farmyard manure the following treatment may be tried :—4-6 cwt. of superphosphate or high-soluble basic slag—the larger quantities when the aim is to build up a reserve of phosphate for subsequent crops ; 1-2 cwt. of sulphate of ammonia or other nitrogenous fertilizer, half in the seed-bed and the remainder after singling when the higher rate of dressing is employed ; 1-2 cwt. 30 per cent. potash salts, the larger dressings in the lighter soils. When dung is used in ordinary quantities the above dressing may be halved ; with abundant farmyard manure, as for example on dairy farms having little arable land, good crops can be grown without further additions.

The kales, although botanically close to the swede, differ in their manurial requirements owing to their being grown primarily for their leaves. There have been few accurate manurial trials on these crops, but we can assume that a more generous nitrogen supply may be used, although the other constituents should not be neglected on this account.

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NOTES ON FEEDING STUFFS

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Summer Feeding of Dairy Cows.—Until comparatively recently, it had been generally accepted that, in the early part of the grazing season, on land reasonably well adapted for milk production, grass would be sufficient for maintenance of the cow and for the daily production of two or three gallons of milk. This view has, however, been subjected to some criticism. There are those who believe that the cow on grass land is capable of a greater output of milk without losing appreciably in condition, more especially if the pasture has been suitably treated with fertilizers and the grazing is carefully controlled so that the grass is kept short and fresh and succulent. Continental practice supports this view. It is not uncommon in parts of the Continent to find that cows which yield upwards of 1,000 gallons in a lactation go through the grazing season without concentrated feeding. During the summer many of these cows give five or six gallons of milk daily.

The possibility of cutting out concentrated feeding for a period when cows are on good grass should appeal to farmers, since it reduces expenditure on food stuffs. In addition, there is evidence that it is good for a cow's health to go without concentrates for a time. This belief has long been held by the

more shrewd and observant dairy farmers, and it is one which merits consideration and trial by those who have been accustomed to feed concentrates more or less liberally even when grass is plentiful and of good quality.

On the other hand, it has been asserted that an abundant or unlimited supply of grass is actually harmful to the milk yield, and that, if the milk yield increases materially when the cows go out to grass, it is proof that the winter feeding and management has been inefficient. In support of these contentions there is little or no evidence of economic importance. Much confusion seems to have arisen from a belief that high yields necessarily mean the most profitable type of milk production. There is need for still closer study of the question in the light of financial results over a period of years. So far, convincing figures are not forthcoming to prove that the feeding of large quantities of concentrates, in preference to the use of the more bulky but less costly produce of our farms, is a system which is financially satisfactory, even when abnormally-high individual yields are obtained.

That some common-sense limitation or control of grass-feeding in the early part of the season is advisable has been generally recognized by farmers. If cows become "blown," or scour excessively through consuming large quantities of fresh succulent grass, a capable manager of cows takes the necessary steps to restrict consumption, but in the ordinary course of events, under normal farming conditions, there should be no need to limit the amount of grass to such an extent that concentrates are required to replace it. It should be sufficient merely to prevent cows over-eating when the grass is wet, or of a character likely to produce the "blown" condition or allied constitutional disturbances. As soon as a system of feeding necessitates the cutting out of grass and its replacement by concentrated foods, the herd owner should very carefully consider just how such a system is likely to affect his costs and returns.

The examination of the milk records of the herds of those whose financial success is measured not so much by abnormally high yields as by satisfactory returns for expenditure shows that the yields of the cows do increase when the cows go out to grass.

There can be no doubt that fresh young grass stimulates the milk flow. Various theories have been put forward by different authorities by way of explanation.

The effect may be due partly to the laxative nature of young grass as a food; possibly the protein may be of exceptionally high digestibility, or it may be that the amides in young grass act similarly to the amides of wet grains. It is widely recognized that the last-named food has a specially stimulating effect on milk production. Hammond and Sanders have suggested that the secretion of milk is influenced by the rate of calcium metabolism, due to some ingredient present in the green tissues; it may be, however, that the stimulating effect of grass is entirely independent of its nutritive value as at present understood.

It has been noted by investigators that the yield of milk begins to fall somewhat sharply about six weeks after the cows have been at grass. The decline, however, is greatest in July and August. The explanation that this drop is due simply to diminution in the feeding value of the grass does not appear to be wholly satisfactory. The drop may be influenced to a minor extent by a deterioration in succulence and nutritive value of the herbage, but an important cause of the falling-off appears to arise from the conditions of greater discomfort to which cows are subjected from July onwards. Heat, flies, and "gadding," are factors which collectively result in very great restlessness and disturbance, leading to impaired functioning and consequent diminution in milk yield.

Looking at the problem from the point of view of inexpensive milk production, it would seem that the need for concentrated foods by cows on strong grass is, in most cases, limited to some suitable, dry food to counteract scouring. It has been suggested that the excess of protein in the grass, through producing physiological disturbances, was the principal cause of scouring. An effort was made, at this Institute, some years ago, to counteract scouring by an attempt to balance the protein in the grass with a starchy food. The result was partly, but not wholly, satisfactory, taken over several seasons and on different fields. The most satisfactory results in counteracting scouring appear to be obtained with a mixture of undecorticated cotton cake used in conjunction with a starchy food, such as maize meal or barley meal.

No adequate proof can be found of the contention that a falling-off in yield of cows at grass is due to some cumulative and detrimental physiological effect of the grass itself. In the writer's experience, such falling off can be lessened by careful attention to the management of the cows throughout

the summer. Any measures which can be taken to safeguard cows against the acute discomforts already mentioned help to prevent a rapid falling-off in yield. Such steps as keeping the cows in during the heat of the day, and protecting them as far as possible from flies, have been found useful. Attention to the management of the pastures, so that green succulent grass is provided, as far as climatic conditions permit, is important, and a supply of green lucerne in a dry critical period of the year is a valuable asset.

Lucerne trials conducted on the Institute farm, on land not considered to be naturally suitable for lucerne growing, have demonstrated the importance of the inoculation of the seed on the lines recommended by Rothamsted Experimental Station, also the greater value of the variety "Grimm" as compared with the variety "Provence," for somewhat adverse conditions.

Much attention is being devoted to the supply of minerals to cows. It is possible that the need for minerals may be over-estimated, but it does seem clear that certain pastures may be deficient in the requisite amount and kind of mineral matter, while others are naturally sufficiently supplied. The difficulty arises in differentiating in practice between the pastures in which the mineral content is sufficiently high and those in which there is actual deficiency. The mineral content of the pasture is a reflex of the mineral content of the soil. When this is recognized, probably the best way of tackling a deficiency is by manuring with suitable fertilizers. To provide minerals for stock through the herbage would seem to be the more satisfactory method. There would appear, however, to be a fairly widespread shortage of sufficient calcium or lime. There is evidence of the value of both calcium and chlorine in the fact that pastures which have proved specially good for milk production, usually have a high calcium and chlorine content. It seems advisable, therefore, to pay special attention to the provision of lime and salt. It is customary for many dairy farmers to provide salt licks in the cowshed or in the field, but an improvement on this practice would be, where necessary, to allow the cows to have access to a mineral mixture, containing both lime and salt. The mineral mixture now employed by the writer consists of four parts ground chalk with one part iodized salt.

If concentrated feeding has to be resorted to in an abnormally dry summer, when the pastures have become too burned up to provide the required amount of herbage, the inclusion

of bran, fed in the form of a wet mash, in a ration has given specially satisfactory results.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	4 12
Maize	81	6·8	5 1
Decorticated ground nut cake	73	41·0	7 12
„ cotton cake	71	34·0	7 0

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·25 shillings, and per unit protein equivalent, 1·76 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 7
Oats	60	7·6	4 8
Barley	71	6·2	4 19
Potatoes	18	0·6	1 3
Swedes	7	0·7	0 10
Mangolds	7	0·4	0 9
Beans	66	20·0	5 18
Good meadow hay	37	4·6	2 14
Good oat straw	20	0·9	1 7
Good clover hay	38	7·0	3 0
Vetch and oat silage	13	1·6	0 19
Barley straw	23	0·7	1 10
Wheat straw	13	0·1	0 16
Bean straw	23	1·7	1 11

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6d. net.

Description	Price per qr.		Price per ton	Manurial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	5 7	0 11	4 16	72	1 4	0·71	9·6
Barley, British feeding	—	—	5 15	0 9	5 6	71	1 6	0·80	6·2
„ Danubian	16 3	400	4 12*	0 9	4 3	71	1 2	0·62	6·2
„ Persian	15 3	„	4 5*	0 9	3 16	71	1 1	0·58	6·2
„ Russian	17 9	„	5 0	0 9	4 11	71	1 3	0·67	6·2
Oats, English, white	—	—	6 7	0 10	5 17	60	1 11	1·03	7·6
„ „ black and grey	—	—	6 5	0 10	5 15	60	1 11	1·03	7·6
„ Canadian Mixed Feed	12 6	320	4 7*	0 10	3 17	60	1 3	0·67	7·6
„ Argentine	11 9	„	4 2	0 10	3 12	60	1 2	0·62	7·6
„ Chilian tawny	14 3	„	5 0	0 10	4 10	60	1 6	0·80	7·6
„ German	20 0	„	7 0†	0 10	6 10	60	2 2	1·16	7·6
„ Russian	14 3	„	5 0	0 10	4 10	60	1 6	0·80	7·6
Maize, Argentine	21 6	480	5 0	0 9	4 11	81	1 1	0·58	6·8
„ South African	22 0	„	5 3†	0 9	4 14	81	1 2	0·62	6·8
Beans, English Winter	—	—	5 10§	1 3	4 7	66	1 4	0·71	20
Peas, Japanese	—	—	18 10†	1 0	17 10	69	5 1	2.72	18
„ Indian	—	—	8 0†	1 0	7 0	69	2 0	1·07	18
Dari	—	—	8 0	0 11	7 9	74	2 0	1·07	7·2
Milling offals—									
Bran, British	—	—	5 10	1 0	4 10	42	2 2	1·16	10
„ broad	—	—	6 2	1 0	5 2	42	2 5	1·29	10
Middlings, fine, imported	—	—	5 12	0 16	4 16	69	1 5	0·76	12
„ coarse, British	—	—	5 0	0 16	4 4	58	1 5	0·76	11
Pollards, imported	—	—	4 7	1 0	3 7	60	1 1	0·58	11
Meal, barley	—	—	6 5	0 9	5 16	71	1 8	0·89	6·2
„ maize	—	—	6 5	0 9	5 16	81	1 5	0·76	6·8
„ „ South African	—	—	5 17	0 9	5 8	81	1 4	0·71	6·8
„ „ germ	—	—	6 2	0 14	5 8	85	1 3	0·67	10
„ locust bean	—	—	5 5	0 7	4 18	71	1 5	0 76	3·6
„ bean	—	—	8 7	1 3	7 4	66	2 2	1·16	20
„ fish	—	—	18 0	3 1	14 19	53	5 8	3·04	48
Maize, cooked flaked	—	—	7 5	0 9	6 16	83	1 8	0·89	8·6
„ gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	9 2	1 8	7 14	74	2 1	1·12	25
„ „ „ 9% „	—	—	8 15	1 8	7 7	74	2 0	1.07	25
„ „ „ 8% „	—	—	8 10	1 8	7 2	74	1 11	1·03	25
Soya bean cake, 5½% oil	—	—	8 7*	1 19	6 8	69	1 10	0·98	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	5 10	1 6	4 4	42	2 0	1·07	17
„ „ Egyptian, 4½% „	—	—	4 17	1 6	3 11	42	1 8	0·89	17
Ground-nut cake, 6-7% oil	—	—	5 17*	1 6	4 11	57	1 7	0.85	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 12	1 19	5 13	73	1 7	0·85	41
Palm kernel meal, 1-2% „	—	—	5 5	0 17	4 8	71	1 3	0·67	17
Feeding treacle	—	—	5 15	0 9	5 6	51	2 1	1·12	2·7
Brewers' grains, dried ale	—	—	4 10	0 17	3 13	48	1 6	0·80	13
„ „ „ porter	—	—	4 0	0 17	3 3	48	1 4	0·71	13
Malt culms	—	—	5 0†	1 6	3 14	43	1 9	0·94	16
Dried sugar beet pulp (*a*)	—	—	4 2	0 8	3 14	65	1 2	0·62	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of March, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 8s. 3d.; P_2O_5, 3s. 1d.; K_2O, 3s. 4d.

MISCELLANEOUS NOTES

Coloured Wool : A Warning

THE Ministry is advised that, within the last three or four years, quantities of wool have been coloured with a substance that causes the wool to become a brilliant orange-yellow on being scoured. Analysis of this colouring matter by the Wool Industries Research Association shows that it is a substance known as Metanil Yellow, which may be a component of some dips or may be an added substance for the purpose of giving bloom to the wool. The substance is a dye-stuff with a strong affinity for wool. The colour thus given to the wool cannot be removed in the course of ordinary commercial processing, and definitely spoils the wool, therefore, for manufacturing purposes. In these circumstances, farmers are strongly advised to avoid the use of dips or washes which may contain this substance.

* * * * * *

The Agricultural Index Number

BETWEEN February and March the general level of the prices of agricultural produce fell by three points to 23 per cent. above the base years, 1911-13. At the corresponding period a year ago a fall of five points to 39 per cent. above pre-war was recorded. While many descriptions of produce became cheaper during the month under review, livestock and milk were chiefly responsible for the decline in the index number.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	—
May	50	42	54	44	34	—
June	48	41	53	40	31	—
July	48	42	45	41	34	—
August	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Wheat prices showed a slight rise in March, and the index figure advanced by 1 point to 30 per cent. below

the pre-war level. The average for barley, however, was 8*d.* per cwt. lower on the month, and the index number fell by 6 points to 3 per cent. below 1911-13. This is the first occasion since last August that the index for barley has fallen below pre-war. Oats were unchanged either in price or index number.

Live Stock.—Values for most descriptions of live stock continued to move in a downward direction. In the case of fat cattle, however, prices were well maintained, although in consequence of a definite rise in the corresponding period of the base years, the March index figure was lower by 2 points as compared with February. Quotations for fat sheep declined on average by ¼*d.* per lb., and the index number by 7 points. Bacon pigs were cheaper by 4*d.* per score lb. and porkers by 6*d.* per score, the relative index figures falling 7 and 5 points to 24 and 46 per cent. respectively above pre-war. Values for dairy cows were about £1 per head lower than in February, and the index figure showed a drop of 2 points, to 30 per cent. above the level of the base years. Store cattle were slightly cheaper at 25 per cent. over pre-war. Store sheep prices were slightly higher, but the index was 4 points lower on the month. Values for store pigs fell by fully 2*s.* 6*d.* per head and the index number dropped by 23 points to 75 per cent. in excess of 1911-13. A year ago, store pigs were 125 per cent. dearer than pre-war.

Dairy and Poultry Produce.—The average contract price of milk was lower than in February, and the index number declined by 12 points to 50 per cent. above the base years. Butter prices showed no material change, but as a fall occurred at the corresponding period of 1911-13, the index figure was 2 points higher on the month. Cheese was dearer at an average of 23 per cent. over pre-war. Values for eggs continued to follow the seasonal downward movement, but as the reduction of about 3½*d.* per dozen in March was proportionately less pronounced than that which occurred in the base years, the index figure rose by 7 points to 24 per cent. above pre-war. At the corresponding period last year, the index for eggs dropped by 20 points to 31 per cent. above 1911-13. The poultry index was 3 points higher on the month at 47 per cent. in excess of the base level.

Other Commodities.—Potatoes showed little change either in price or index number. Hay was again a little cheaper, but as the reduction in the case of the meadow variety was less pronounced than in the base years, the combined index for hay advanced by 1 point to 9 per cent. below pre-war.

Values for wool at the Bradford Exchange showed a recovery from the very low levels recorded for some months past, and the index number rose by 5 points to 20 per cent. below 1911-13, this being the first occasion that wool prices have moved upwards to any appreciable extent since the level began to decline early in 1929. Vegetables were dearer than in February, and the general index number appreciated by 28 points to 68 per cent. over the level of the base years.

Index numbers of different commodities during recent months and in March, 1929 and 1930, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930		1931		
	Mar.	Mar.	Dec.	Jan.	Feb.	Mar.
Wheat	30	12	—17*	—24*	—31*	—30*
Barley	28	—2*	Nil	3	3	—3*
Oats	36	—15*	—20*	—16*	—18*	—18*
Fat cattle	33	37	20	27	25	23
„ sheep	52	52	44	50	37	30
Bacon pigs	58	90	26	34	31	24
Pork „	66	96	53	57	51	46
Dairy cows	30	30	30	33	32	30
Store cattle	22	26	22	28	29	25
Store sheep	56	48	50	48	35	31
Store pigs	57	125	104	114	98	75
Eggs	93	31	14	23	17	24
Poultry	40	52	31	47	44	47
Milk	60	55	65	62	62	50
Butter	54	37	12	14	16	18
Cheese	74	40	16	21	19	23
Potatoes	40	—24*	49	71	73	70
Hay	7	34	—7*	—8*	—10*	—9*
Wool	60	11	—19*	—22*	—25*	—20*

* Decrease.

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Poultry-Keeping on the Farm

THE following note has been communicated by Mr. E. Rea, N.D.A., N.D.D., the Agricultural Organizer for Middlesex, and is an introduction to periodical reports which he will furnish on the progress of the demonstration in farm poultry-keeping which the generous co-operation of Sir John Fitzgerald has enabled the Middlesex Agricultural Education Committee to inaugurate at Stanmore in that county.

During recent years, economic reasons have induced farmers to explore the commercial possibilities of poultry-keeping, and it may be advantageous, therefore, to draw attention to a simple, remunerative system of commercial egg-production specially adapted to the average farmer's conditions. At the outset it may be stated that poultry require sound management, *i.e.*, regular feeding, simple but adequate housing and periodic changes of ground. They are seen at their best as improvers of poor grass land. The farmer about to set up a poultry department usually looks for advice to the poultry industry, where he finds such a diversity of practice and opinion that he is generally at a loss to know which is the best course to adopt. The breeding of pedigree poultry is a specialized line which may easily involve the inexperienced in heavy expense or even loss ; it should not be attempted by the farmer unless special facilities exist. Unless care, too, is taken, a permanent poultry plant has certain disadvantages which, however, are eliminated in the system under notice.

A farm poultry department should be essentially :—

(i) Low in capital cost (stock and plant).
(ii) Cheap and simple to maintain.
(iii) Not subject to heavy depreciation or replacement costs.
(iv) Readily adaptable and portable.

A "flying flock," kept for commercial egg production in small portable slatted-floor houses with portable wire runs, has the advantage of the semi-intensive and the free-range systems without their disadvantages. Provided the land is well drained, "folding" poultry on grass land is the farmer's ideal method, and it conforms to the above conditions in a striking manner.

Slatted-floor houses mounted on wheels, fitted with nests and removable slatted floors, droppings-trays and food and water-hoppers, can be soundly constructed for £12, a cost of 3*s.* per bird. Easily erected and portable wire runs 4 ft. 6 in. high, including posts and simple wire gates, will cost £50 for 1,000 birds, or 1*s.* per bird. The expense and labour of hatching and rearing may be avoided by the purchase of half-reared, *i.e.*, three-month-old pullets of a reliable strain. For this purpose, first crosses such as White Leghorn × White Wyandotte or White Leghorn × Rhode Island Red (light breed male) are eminently suitable, being cheap to buy, healthy and robust, and less broody than the heavy breeds. First-class pullets of this type at 6*s.* per bird will be a sound

investment, and it will not cost more than another 2*s*. a head to bring them into lay.

Labour is reduced and maintenance is cheap, especially with a one-man unit of from 1,000 to 1,200 birds. The houses are readily moved, fouling of the land is prevented, no litter is required, droppings-trays are easily cleaned and only require attention weekly, while the manure, being dry, can be evenly applied to the land. Stock in wire runs is more easily controlled, overcrowding at feeding and roosting is avoided and health is better. The ground is evenly stocked, can be changed as required and the birds are protected from marauding dogs and foxes. Depreciation is reduced to a minimum: small houses have a high second-hand value, and will last 10 years, and first cross hens have a higher carcass value than light breeds.

"Poultry folding" may be adapted either to open downs or enclosed fields, and wire netting, though recommended, is not essential. Initial outlay may be spread over two years by starting with half the contemplated unit and retaining birds for two laying seasons. This will result in a stock, half hens and half pullets, and will give a more even distribution of egg-supplies, replacement cost and depreciation. Further practical details will be elucidated during the progress of a 1,000-bird Two Years' Demonstration at Stanmore referred to above.

Farmers will be interested to know that the first six months egg-output at this Demonstration has exceeded 85,000, and has averaged over 600 daily since mid-December.

* * * * * *

Summer Demonstrations at Rothamsted and Woburn

MEMBERS of farmers' and farm workers' associations and clubs, chambers of agriculture and horticulture, agricultural students' societies and similar organizations, are again invited by the Director, Sir John Russell, to inspect the experimental plots at Rothamsted and Woburn at any convenient time between now and the end of October. Mr. H. V. Garner and Captain E. H. Gregory will be available to act as demonstrators. A whole day should be devoted to each station, and even when the weather is too inclement to permit of close investigation of the fields, the time can be well filled and a visit should prove interesting and instructive.

On the heavy soil of Rothamsted, the experiments deal with the manuring of arable crops, especially sugar-beet, potatoes, mangolds, fodder mixtures, barley, oats, wheat, permanent meadow hay and new grass land. Rotation experiments are in

progress comparing (1) various types of straw manure with dung made in the ordinary way; (2) different levels of manuring with nitrogen, phosphate and potash respectively. Other experiments deal with the effect of modern slags and mineral phosphates on arable land and hay land; crop diseases and pests; the laying down of land to grass. There are also demonstrations of modern implements, tractors and good types of tillages.

At Woburn, where the soil is light, the experiments are concerned mainly with the manuring of potatoes, sugar-beet, malting barley, wheat, and the use of green manures.

It will be more convenient if arrangements for parties are made well in advance to prevent dates clashing, but no farmer need forego a visit because he has been unable to fix a date beforehand. All communications should be addressed to the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

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Oil Cakes and Extracted Meals

As a broad generalization it is normally true to say that it is possible to grow feeding stuffs on the farm more cheaply than concentrates of equal value can be purchased, but there are many styles of farming that do not permit of the production of everything required. Grassland farming, for example, where there is little or no arable land, must depend on purchased feeding stuffs, apart from any possibility of securing the utmost value from the grazing and hay. Prices may make it profitable to sell crops off the farm and buy imported concentrates; while intensive milk-production in mixed farming may make it necessary to buy concentrates. As a general rule, therefore, it is not feasible to avoid making some use of purchased feeding stuffs.

It is essential, then, that the farmer should be thoroughly acquainted with the true feeding value and the particular properties of the concentrated feeding stuffs that he has to buy. To assist the farmer, the Ministry has published a new Bulletin* written by Dr. H. E. Woodman, M.A., Ph.D., D.Sc., which if read in conjunction with "Home-Grown Feeding Stuffs"—another Bulletin† by the same author—should form a very useful guide to the feeding of stock.

* Bulletin No. 11: "Oil Cakes and Extracted Meals," obtainable, price 10*d*. post free, from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2.

† See note in this JOURNAL, February, 1931, page 1063.

Enforcement of Minimum Rates of Wages.—During the month ending April 14, legal proceedings were instituted against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines			Costs			Arrears of wages			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Cornwall	Penryn	—			1	0	0	35	0	0	1
Somerset	Keynsham	—			—			2	0	0	1
,,	,,	*			—			1	4	0	1
,,	Temple Cloud	1	1	0	1	1	0	24	0	0	1
,,	,,	2	2	0	2	2	0	54	0	0	2
,,	,,	1	1	0	1	1	0	24	0	0	1
,,	,,	1	1	0	1	1	0	8	0	0	1
Yorks, N.R.	Thornaby-on-Tees	*			5	0	6	29	6	2	3
		£5	5	0	£11	5	6	£177	10	2	11

* Dismissed under Probation of Offenders Act.

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Foot-and-Mouth Disease.—An outbreak of foot-and-mouth disease occurred on March 24 at Briercliff, near Burnley, Lancs, and the usual restrictions were imposed upon an area with a radius of approximately 15 miles round the infected premises. These restrictions have now been withdrawn and at the time of going to press there is no part of Great Britain subject to foot-and-mouth disease infected area restrictions.

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Agricultural Exhibition at Hanover, 1931.—All branches of agricultural practice will be represented at the 37th Annual Exhibition organized by the German Agricultural Society, which is to be held at Hanover from June 2-7 of this year. Special attention is being paid to the animal breeding section, which will include valuable specimens of all species of livestock. Arrangements are in progress for a comprehensive display of the latest agricultural machinery and implements. Other attractions will be daily riding and driving shows, and a rural cinema for instructional films dealing with practical phases of animal and plant breeding. Further particulars can be obtained on application to the Secretary, German Agricultural Society, 14 Dessauerstrasse, Berlin, S.W. 11.

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APPOINTMENTS

COUNTY AGRICULTURAL EUCATION STAFFS: ENGLAND

Somersetshire: Miss L. Tomlinson, N.D.D., has been appointed Assistant Instructress in Dairying, *vice* Miss L. C. Furnell, N.D.D., B.D.F.D.

Miss V. E. Bidmead has been appointed Matron at the County Farm Institute, *vice* Miss F. Duncan.

NOTICES OF BOOKS

The Plant Quarantine and Control Administration. Its history, activities and organization. By Gustavus A. Weber. Pp. x + 198. Service Monographs of the United States Government, No. 59. 1930. (Washington: The Brookings Institution. Price $1·50.)

This monograph is one of a series issued by the Brookings Institution of Washington with the object of aiding "constructively in the development of sound national policies"; it describes the history, activities and organization of the United States "Plant Quarantine and Control Administration" which has recently been formed to carry out the functions of the Federal Horticultural Board as well as certain other regulatory work previously dealt with by the Bureaux of Entomology and Plant Industry. Although the U.S.A. was not the first country to enact legislation with the object of preventing the introduction or spread of plant diseases and pests (the first Federal Act was passed in 1912), it has nevertheless built up an organization for administering such legislation which, in point of size and comprehensiveness, is unique. That this is no exaggeration will be realized from the facts that the budget of the Administration for 1930 amounted to nearly £1,700,000, and that the staff comprised well over 700 members not counting part-time employees. When it is remembered that the Department is Federal only, and that in most cases the respective States have, in addition their own special organizations, to deal with State quarantines, the importance now attached to the subject in the U.S.A. becomes evident.

From the European point of view, interest in the activities of the Quarantine Administration (or its forerunner, the Federal Horticultural Board) has in the past been directed mainly to that section of the work concerned with foreign quarantines, and in this monograph will be found a clear statement of the sequence of events that led to the passing of the celebrated Quarantine 37 and to other foreign quarantines operative to-day. In an administrative document any detailed discussion of the different pests and diseases dealt with by the various quarantines will not be expected, but in certain cases some amplification seems desirable in order to prevent misunderstanding—*e.g.*, the statement on page 60 concerning Wart Disease that "There appears to be no known remedy for the disease, and its existence in the soil puts an end to potato culture therein," is incorrect. No doubt the author was referring to susceptible varieties of potato only, but the American reader may not have heard of the numerous "immune" varieties now widely cultivated in Great Britain and elsewhere, and he might be misled into accepting the statement at the face value.

The general policy of the U.S.A. in regard to the introduction of foreign plants likely to be affected by diseases or pests has been the source of much controversy, both in that country itself and also elsewhere, and not unnaturally it has been strongly opposed by interests concerned in the introduction of plants into America. This, however, is well known, and no further reference can be made to it here. On the other hand, the work of the Quarantine Administration of a domestic character is less generally appreciated, and it may be worth pointing out that all countries can learn much from American experience. The most obvious deductions are the importance of excluding from a country, as far as is possible, all pests and diseases not already established within its boundaries, and, where such exclusion cannot be achieved, the necessity of carrying out measures of eradication before the pest or disease has spread beyond the initial colony; it is clearly a matter of extreme difficulty, and if it were not for one or two exceptions

it might be said to be an impossibility to eradicate a pest or disease that has become widely and firmly established.

Another point of no less importance is that measures to deal with a foreign invader must be on an overwhelming scale, and must be applied without hesitation if they are to have the chance of success. In the U.S.A., those in charge of the work at the beginning were compelled to feel their way, and not until public opinion had been aroused by the widespread losses due to some introduced pest or disease were they allowed to make a big effort, when it was already too late. Therefore, in spite of the expenditure of millions of dollars, the attempts to eradicate such pests as the Corn Borer, the Japanese Beetle, Chestnut Blight, and the White Pine Blister Rust have failed. As a result of this experience, however, public opinion has now changed, and when in 1929 a crop worth £48,000,000 was jeopardized owing to the establishment of the Mediterranean Fruit Fly in Florida, Congress at once voted £1,000,000 for the work of eradication: measures of a most drastic character involving considerable sacrifices on the part of citrus growers were put in operation, with the result that at the time of writing the pest is not known to occur in the States. It is yet too early to feel sure that the work has been completely successful, but if this proves to be the case the incident will rank as the most remarkable case of insect eradication ever carried out, and one well worth the million or more expended upon it. Fortunately Britain is not likely to be faced with an invasion by this particular pest, but the principle will be the same in the case of any foreign pest or disease, and American experience should not be forgotten.

Probably enough has been said to show that the book is worthy of the attention of every reader who is concerned with plant quarantine measures: for whatever may be his views on the more controversial aspects of the subject, he can hardly fail to learn something from an undertaking carried out on such a scale as that controlled by the Plant Quarantine and Control Administration.

Russian Agriculture during the War. *Rural Economy* by Alexis N. Antsiferov, Alexander D. Bilimovich, Michael O. Batshev and Dimitry N. Ivantsov. *Land Settlement*, By Alexander D. Bilimovich. Pp. xvii+394. (New Haven, Connecticut: Published for the Carnegie Endowment for International Peace by the Yale University Press. 1930. London: Humphrey Milford, Oxford University Press. Price 18*s*.)

This book comes to hand at an appropriate moment. Throughout the world the farming community is confronted with economic difficulties that seem insuperable, and the more contributions made to the history of the subject in recent or remote times, and in all parts of the world, the more likely is some solution of these difficulties to appear.

Although serfdom was abolished in Russia in 1860, little more than that was done for the improvement of its agriculture until the beginning of the twentieth century. Just prior to the war, however, more interest was being taken in this subject and there was a steady trend towards improvements. An increased amount of land had passed into the peasants' hands, schemes for land settlement throughout the vast, sparsely populated areas of this great country were in progress, and there was a definite extension of the arable acreage. Improved seed and the increased use of machinery had led to an increased yield. Large schemes of land drainage and irrigation were contemplated and some were actually in progress. Provision for the teaching of the better technique so generally necessary in the farming of the country was being made. The stock position was not, however, so good as that of arable farming.

The effects of mobilization, involving the withdrawal of men and animals from the industry, do not seem to have been particularly harmful, because there was usually a surplus of both before the war, owing to the conditions of production and other factors. Certain changes did of course take place, although there were none in the area cultivated in Asiatic Russia. The consequence of there being less available labour in European Russia resulted in a diminution of the area of the large estates cultivated, but this was partly compensated by an increase in the cultivated area of peasant's land. There was, nevertheless, a retrogression in the distribution of the various kinds of crops.

In the realm of animal breeding the proportion of young stock, both in horses and cattle, was abnormally high at the end of the war, and the value of the horse population for working was thus temporarily lowered. The opinion of the authors of the book is that while the war had an unfavourable effect on animal breeding, it was by no means undermined, nor was it condemned to a permanent decline.

The revolution, naturally enough, led to a good deal of chaotic and ineffective legislation by the new rulers who were inexperienced in administration although theoretically willing and ready to take it over with all its burdens. In spite of this, however, these writers hold the opinion that there can have been no substantial reduction in the area under crops in the first year of revolution, but that the quantity of land under the plough began to diminish noticeably in the autumn of 1917, and the results of this were felt in 1918. The condition of the country was so disturbed that the harvest could not be gathered, and in the spring of 1918 the country was in a state of civil war, added to which the transport system, never very adequate, broke down.

Moreover, the food control measures of 1917 failed by reason of the lack of experience of its administrators. There was a good deal of overlapping and friction between departments; one of the results was a decrease in the numbers of stock in the country in 1917 and 1918 and the high grades kept on the large landed estates were exterminated. The growing shortage of horses was indeed reflected in the number of acres ploughed per horse. For instance, in the province of Kursk 10·3 acres of land per horse were ploughed, and even so the area was only 18 per cent. of that of 1916.

The book is completed by an essay on "Land Settlement in Russia and the War" which gives a brief but clear outline of what was being done and how the war affected the operations. Both sections of this work are to be commended for their conciseness and clarity, and, although its authors do not regard the "five year scheme," now in being, as likely to be successful, the information they supply should be of great value to all who are interested either in world agricultural conditions, or in the past and future of the vast area of Russia.

The Range Cattle Industry. By Edward Everett Dale. Pp. 216. Illustrated. Maps. (Norman: University of Oklahoma Press, U.S.A. 1930. Price 4 dollars.)

The romance of the life of the cowboy as portrayed by so many writers of fiction has detracted from the real romance of the rise and decline of the cattle ranching industry on the open range in the south-western and western States of America. Professor Dale, who was himself a cowboy and rancher for five years, who has kept a post office and worked in a store in the cow-country, and who has been a deputy sheriff, has now drawn our attention to the industry as a whole.

Beginning with the condition of affairs in Texas at the end of the American Civil War, Professor Dale shows how the vast increase of

cattle that had taken place on the ranges, being neglected during the War, led to the necessity for new ranges. The rise of the railway age with its large construction gangs and the consequent demand for food, the extermination of the buffalo, the placing of the Indians on reservations, and the growing demands of the East, gave a huge impetus to the range cattle industry. Within so brief a period as about 20 years, almost all the huge open territory had been appropriated to grazing, and the area covered was greater than all that devoted to crop-raising east of the Mississippi.

The peak of success in open range breeding was reached, and in another 20 years the "homesteader" or farmer had taken over most of the range land suitable for cereal growing, the large cattle ranch on the open range having to give way before the world demand for corn. During the last 30 years the industry has been carried on within wire fences, because of their obvious advantages in control and handling of the stock. Moreover, the methods of breeding and preparing cattle for market have passed out of the primitive range conditions. Relations between the range country and the Corn Belt have been established, and stock from the range are finished in the Corn Belt, while improved stock from the latter go to the range country for the improvement of range breeds. (See *Beef Cattle: Their Feeding and Management in the Corn Belt States.* By Roscoe R. Snapp—notice in this JOURNAL, December, 1930.)

The work involved in the preparation of Professor Dale's book must have been very arduous, and we have to thank him for a concise and coherent story of a development which, like so much of that in the United States of America, is truly a romance of modern times.

The Microscopic Examination of Cattle Foods.—By S. T. Parkinson, B.Sc., and W. L. Fielding, B.Sc.Agric., Dip.Agric. (Ashford and London: Headley Brothers, The Invicta Press, 1930. Pp. viii + 97. Illustrated with 15 plates, comprising 125 original photographs. Price 6*s.* 6*d.* net.)

One of the pleasing features of present-day agriculture is the increasing frankness of the manufacturers of proprietary cakes and meals. Many firms now go so far as to advertise and declare the amounts and kinds of ingredients in the compound foods which they sell to the farmer. This is a sign of progress in the right direction. There can be no doubt that adulteration of feeding stuffs is a much rarer occurrence nowadays than it was some twenty or thirty years ago, a happy state of affairs which is to be ascribed to the protective influence of the Fertilizers and Feeding Stuffs Act and to a general advance in the farmer's understanding of the nature of feeding stuffs, as well as to a genuine desire on the part of many manufacturers to be of good repute in the eyes of the farmer and to make up their compound foods according to the dictates of the accepted feeding standards.

Nevertheless, cases of food adulteration do occasionally come to the public notice, more especially perhaps in connexion with imported foods. Such adulteration frequently defies detection by the routine operations of the analytical chemist and is only brought to light by careful microscopic examination. One need only refer to the occasional presence of small amounts of the dangerous castor seeds in foreign consignments of oil cake. To those whose task it is to detect adulteration of feeding stuffs by the method of microscopic botanical inspection, the volume under review should prove invaluable. With the help of the detailed and lucid descriptions and the admirable photographic illustrations given in the book, it should be possible for anyone, who can use a microscope, to determine whether a cake or meal consists

of the material which it purports to be, and to identify any considerable quantity of impurity that may be present. The technique of microscopical investigation of feeding stuffs is fully gone into in the introductory section. Dr. Voelcker certainly does not overstate the case when he writes, in a short foreword, that the treatise should "prove a useful help alike to students, teachers and agricultural analysts."

The Complete Book of Gardening. By J. Coutts, A. Edwards and A. Osborn. Pp. 768. 16 colour plates, 80 composite photographic plates and 65 diagrams. 1930. (London: Ward, Lock & Co., Ltd. Price 15*s.* net.)

Books on gardening take many forms and probably all have a value for the student. Some are the work of horticultural journalists, others have been compiled by enthusiastic amateur gardeners, while some delightful books have been written by literary followers of the craft, and these are esteemed for their style as well as for the information they contain. *The Complete Book of Gardening*, however, is the production of trained professional gardeners and, as may be expected, it is a plain, straightforward account of the many operations which, sooner or later, every gardener is required to perform. The work sets out in great detail the facts about garden construction, garden tools, soil management, plant production, pest control and similar matters, and will be greatly appreciated by all those seeking information on the right method of carrying out any particular job, and they will be certain to find what they need. Most gardening books and encyclopedias devote a great deal of attention to plants and flowers and very little to actual gardening operations, but in this work the operations rightly predominate. One chapter, No. XXXIV, naturally a long one, is given up to the description of plants. The excellent colour plates and numerous other illustrations amplify the information given in the book, and help to a clear understanding of the many diverse tasks which fall to the lot of the modern gardener.

The Country Life of the Nation. Edited by W. Gee. Pp. xv+214. (University of North Carolina Press. London: Oxford University Press. Price 9*s.* net.)

In this comprehensive survey, a group of specialists deal with seven aspects of the problem of the agricultural and rural life of America. The burden of the first section on the Retention of Farm Wealth is to criticize current proposals for improving agriculture. It is held that a permanently prosperous industry can only be set up by making farmers individually more efficient as producers for the market, and by fostering collective action where necessary. The problem of the 750,000 agriculturists who move each year to the towns is discussed in the second section. "Cityward Drift" is attributed to growing industrialization, greater efficiency in farming due to mechanization, and to a higher standard of living causing increased demand for factory goods. The writers believe that the selective process will leave farming with good-class personnel. Sections 4-6 deal with vital aspects of country life that are not economic in character; the writers plead for better rural education and more active co-operation between agriculture and the rural village.

The third section on farm group activities and also the last section in the book deal particularly with marketing. The first half of the former regards collective action in production and marketing as a life-saving step for the cotton and tobacco growers of the southern States, the writer believing that "unorganizable farmers imperil both farm life and national life" (p. 92). The account of the Eastern Shore

Produce Exchange is interesting because standardization was found to be the first step in efficient marketing, and because the President of the Exchange believes that "the larger the percentage (of the crop) controlled, the more efficient will be the operations and the greater the return to the members" (p. 101). In the final section entitled "Farmer-Controlled Commodity Marketing Essential to Prosperous Farming," the powers of the Federal Farm Board to solve the marketing question are regarded as inadequate. While maintaining that to compel the four million non-co-operating farmers to join the two million now in the co-operative movement would be futile, the writer holds firmly to the view that some method of securing comprehensive organization is desirable, in order to offset, by farmer-owned and farmer-controlled Marketing Boards organized on commodity lines, the huge combines now controlling the finished products made from farm raw materials. Such Boards must be nation-wide, incorporating existing co-operatives and all individual producers, and must have power to control the production, distribution and sale of the commodities marketed. They should aim at price stabilization, and for this purpose have power to determine production quotas and inter-state shipment. It is argued that only in this way can agriculture be put on an economic par with industry.

Principles of Farm Mechanics. By M. A. Sharp, M.S., and W. M. Sharp. Illustrated. Pp. xx+269. (New York: J. Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 1930. Price 15*s*. net.)

The aim of this book is to facilitate instruction in the manipulative arts as applied to agriculture. Its usefulness, however, should extend far beyond the farm; in fact, to everybody interested in such processes as soldering, glazing, drawing, the care and use of woodworking tools, elementary carpentry, harness repair, pipe-fitting, elementary blacksmithing, rope manipulation and kindred subjects. The value of this useful and informative book is enhanced by many practical figures and illustrations.

Agricultural Progress. The Journal of the Agricultural Education Association. Vol. VII, 1930. Pp. 168. (London: Ernest Benn, Ltd. Price 5*s*. net.)

The present issue of this publication maintains the high standard set in previous numbers. "Recent Progress in Agricultural Biology" is chronicled by specialists in their various departments, viz., Plant Anatomy and Physiology, Economic Mycology, Agricultural Entomology, Non-Cereal Crop Plants and Seed Testing. Under the general headings, Agronomy, Animal Husbandry, Dairying and Education, problems of breeding, nutrition, disease and general research are discussed. There are articles on agricultural conditions in Nottinghamshire and Buckinghamshire contributed by their respective County Agricultural Organizers; also an interesting paper on Robert Bakewell, "Pioneer of English Stockbreeders," to whom a memorial has recently been erected at Dishley Grange where he was born two centuries ago. The number concludes with reports of conferences, obituaries and reviews.

The Agricultural Landowner's Handbook. By R. S. Gardiner, F.S.I. Introduction by Lord Clinton. Third edition. Pp. 192. (London: Central Landowners' Association, 7 Charles Street, St. James's Square, S.W. 1. Price 5*s*. net.)

This useful manual explains in concise and intelligible form the law relating to the taxation of landed property. Recent legislation such as the Rating and Valuation Acts of 1925 and 1928, the Agri-

cultural Rates Act of 1929, and the Local Government Act of the same year, has rendered drastic revision necessary. The information has been brought up to date and should be of assistance to those concerned in the ownership, occupation and management of land.

Education in Rural Wales. Pp. 180. (His Majesty's Stationery Office. London: Adastral House, Kingsway, W.C. 2. Cardiff: 1 St. Andrew's Crescent. Price 3*s.* net.)

A Departmental Committee of the Board of Education was appointed three years ago, under the chairmanship of Sir John Eldon Bankes, to inquire into the public system of education in Wales and Monmouthshire in relation to the needs of rural areas, and to advise how these needs might best be met having regard to the requirements of a general education, of rural industries, business and professions and of life in a rural community. The report now issued contains a valuable introduction detailing the history of education in Wales from early times and a comprehensive review of the present position, together with conclusions and recommendations which should be of interest to all concerned in educational problems. The Report is issued in Welsh as well as in English.

The West of Scotland Agricultural College Former Students' Club Journal, No. 11. Pp. 68. (Free to members. Obtainable by non-members from J. W. Reid, Herts. Institute of Agriculture, Oaklands, St. Albans. Price 6*d.*)

This interesting little publication is the official organ of the Former Students of the West of Scotland Agricultural College. The current number, which appears in a new and attractive format, contains much informative matter, including an article dealing with the B.Sc. (Agriculture) Degree of the University of Glasgow, and a symposium on agricultural education.

Husbandry: A Quarterly Publication dealing with the Science of Norfolk Farming. Vol. I, No. 1. (Norwich: A. E. Soman & Co., Ltd., 37 St. Andrew's Street. Price 1*s.*)

This publication is issued by the Norfolk Agricultural Education Sub-Committee, and supplied gratis to residents in the county. It contains a number of useful articles by special contributors, as well as papers giving results of practical and experimental work at the Sprowston Station which should assist farmers to keep in touch with the latest developments of agricultural science.

The Intensive System of Poultry Keeping. By W. Heale, F.B.S.A., and G. E. Reddaway, F.B.S.A. Pp. v + 87. (London: Crosby, Lockwood & Son. Price 2*s.* 6*d.* net.)

Intensive methods of one sort or another have been practised by poultry keepers in this country from time immemorial. Mr. Geylin's egg farms on "factory" lines created quite a furore during the sixties of last century, to be followed some thirty years later by the "Philo" system from America, but in neither case could unqualified success be claimed. More recently there has been a revival of interest, evidenced by the number of articles and books dealing with the subject which have issued from the Press. Despite the improvements that have been made by its modern advocates, the intensive system has obvious limitations. Probably its chief disadvantage is that birds kept in confinement are more prone than others to such habits as feather eating, and vent and toe pecking. Provided hygienic conditions can be secured, however, the suburban backyarder and the rural cottager should find

the intensive rearing system superior to the small open run in which it is so difficult to keep the land clean and dry, especially during the winter months; and even on poultry farms the system may be confidently recommended for laying as distinct from breeding stock. It has proved successful with chickens up to 8 or 10 weeks old, and on farms where the runs had become foul or infested with coccidiosis or nematodes, its adoption has sometimes been the means of converting failure into success. One distinct and obvious advantage of intensive rearing is that it enables a larger head of stock to be kept on a given area than would otherwise be possible. The present manual is based largely on the practical experience of the authors, and should prove useful and informative to poultry keepers whose circumstances warrant the adoption of the system.

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ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

Gras, N. S. B. and *E. C.*—The Economic and Social History of an English Village (Crawley, Hampshire), 909-1928. (Harvard Economic Studies 34.) (730 pp.) Cambridge, Mass.: Harvard University Press; London: Oxford University Press, Humphrey Milford, 1930, 34s. [333.5 (42); 63 (09).]

Cormack, A. A.—Teinds and Agriculture. (xi + 206 pp.) London: Oxford University Press, Humphrey Milford, 1930, 7s. 6d. [348.]

Punnett, R. C.—Notes on Old Poultry Books, with a Bibliography up to 1880 by *E. Comyns Lewer* and *R. C. Punnett.* (40 pp. +1 plate.) London: "The Feathered World," 1930, 1s. 6d. [01; 63.65.]

Thurstan, V.—The Use of Vegetable Dyes for Beginners. (57 pp.) Leicester: The Dryad Press, 1930, 2s. 6d. [63.342.]

International Labour Office.—Studies and Reports. Series K (Agriculture). No. 10:—The Law on the Contract of Employment of Agricultural Workers in Austria, Germany and Hungary. (63 pp.) Geneva, 1930. London: P. S. King & Son, 1s. 6d. [331 (4); 331.88.]

U.S. Department of Commerce.—Bureau of Foreign and Domestic Commerce. Trade Promotion Series No. 79:—Handbook of Foreign Tariffs and Import Regulations on Agricultural Products—I. Fresh Fruits and Vegetables. (vi + 109 pp.) Washington, 1929, 20 cents. [337; 382; 614.3; 63.41 : 38; 63.51 : 38.]

U.S. Department of Commerce.—Bureau of Foreign and Domestic Commerce. Trade Promotion Series No. 85:—Handbook of Foreign Tariffs and Import Regulations on Agricultural Products—II. Canned Foods in Europe. (xi + 287 pp.) Washington, 1929, 45 cents. [337; 382; 614.3; 664.8.]

Russian Agriculture during the War: Rural Economy, by *A. N. Antsiferov*, in collaboration with *A. D. Bilimovich, M. O. Batshev* and *D. N. Ivantsov*; The Land Settlement, by *A. D. Bilimovich.* (394 pp.) (Economic and Social History of the World War, Russian Series.) New Haven: Yale University Press; London: Oxford University Press, Humphrey Milford, 1930, 18s. [325 (47): 63 (47); 63 (08).]

Agricultural Economics

University of Bristol : Department of Agriculture and Horticulture.—The Wiltshire Agricultural Accounting Society. Analysis of Four Years' Financial Accounts, by *C. V. Dawe.* (26 pp.) Bristol, 1930. [338.1 (42) ; 657.]

University of Cambridge : Department of Agriculture.—Farm Economics Branch, Report No. 16 :—Sugar Beet in the Eastern Counties, 1929. Being the Final Report on an Investigation into the Financial Results of Sugar Beet Growing, and the Principal Factors Influencing Them during the Three Seasons, 1927, 1928 and 1929, with Particular Reference to the Latter Year, by *C. Burgess* and *P. E. Graves.* (ix + 70 pp.) Cambridge : Heffer, 1930, 2s. 6d. [63.3433 (42).]

South-Eastern Agricultural College, Wye.—Department of Economics.—Investigation into Farming Costs of Production and Financial Results. Report No. IX.—Pig Keeping Costs and Financial Results for Six Years, by *J. Wyllie.* (pp. 289-312) Wye, 1930, 1s. [338.1 (42) ; 338.58 ; 63.64.]

Lee, V. P.—Principles of Agricultural Credit. (vii + 405 pp.) New York and London : McGraw-Hill Book Co., 1930. 20s. [332.71.]

Rural Reconstruction Association.—The Organization of Marketing in British Agriculture, prepared by the Executive Committee of the Association, with a Preface by the Lord O'Hagan. (31 pp.) Beaconsfield, 1930. [338.1 (42) ; 381 ; 382.]

United States Department of Agriculture.—Technical Bulletin No. 179 :—Co-operative Marketing of Fluid Milk. (92 pp.) Washington, 1930. [334.6 ; 63.716.]

Agricultural Research and Education

Colonial Office.—Annual Reports of the East African Agricultural Research Station, Amani. I.—1928-29 (Colonial No. 50). (20 pp.) London : H.M. Stationery Office, 1930, 6d. II.—1929-30 (Colonial No. 51). (36 pp.) London : H.M. Stationery Office, 1930, 1s.

University of Leeds and Yorks. Council for Agricultural Education, No. 165 :—Guide to Experiments and Demonstrations at Askham Bryan Farm, York, and in the County of Yorkshire, 1930. (95 pp.) Leeds, 1930.

Stewart, R. M., and *Getman, A. K.*—Teaching Agricultural Vocations : A Manual for Teachers in Preparation and in Service. (ix + 377 pp.) (2nd Edition.) New York : Wiley ; London : Chapman & Hall, 1930, 15s. [37 (02).]

U.S.A. Federal Board for Vocational Education.—Bulletin No. 13, Agricultural Series No. 1 :—Agricultural Education—Organisation and Administration (Revised). (63 pp.) Washington, 1930. [37 (73) ; 37.]

U.S.A. Federal Board for Vocational Education.—Bulletin No. 103, Agricultural Series No. 25 :—Methods of Teaching as Applied to Vocational Education in Agriculture (Revised). (74. pp.) Washington, 1930. [37 (73).]

Botany

Bower, F. O.—Size and Form in Plants, with Special Reference to the Primary Conducting Tracts. (xiv + 232 pp.) London : Macmillan, 1930, 12s. 6d. [58.]

Ridley, H. N.—The Dispersal of Plants throughout the World. (xx + 744 pp. + xxii plates.) Illustrations by Miss M. B. Moss and the Author. Ashford, Kent : L. Reeve, 63s. [58 ; 58.19.]

Soils and Manures

Mitscherlich, E. A.—Die Bestimmung des Düngerbedürfnisses des Bodens. (Dritte auflage). (119 pp.) Berlin: Parey, 1930. [63.113; 63.16.]

Harper Adams Agricultural College.—Liming in Shropshire, by *W. M. Davies.* (4 pp. + 1 plate.) [63.15.]

Pusa: Imperial Institute of Agricultural Research.—Bulletin No. 204:—A Method of Increasing the Manurial Value of Bone Phosphate, by *N. D. Vyas.* (21 pp. + 1 plate.) Calcutta, 1930, 10d. [63.1672; 63.168.]

Field Crops

Cox, J. F.—Crop Production and Management. (2nd Edition, Revised.) (xii + 469 pp. + 1 plate.) New York: Wiley; London: Chapman & Hall, 1930, 13s. 6d. [63.3.]

Scotland, Department of Agriculture.—Key to Potato Trials and Collections at East Craigs and Philpstoun, 1930. (52 pp.) Edinburgh, 1930, 6d. [63.512.]

University College of Wales, Aberystwyth: Welsh Plant Breeding Station.—Series H., No. 11 (Seasons 1921-29):—I—Grazing and Manurial Trials on Permanent and Prepared Swards, and II—Factors Affecting Seed Production of Red Clover. (91 pp.) Aberystwyth, 1930, 3s. 6d. [63.33; 63.33–16; 63.60433.]

Imperial Bureau of Plant Genetics.—Herbage Plants. Bulletin No. 1:—Miscellaneous Information Relating to Breeding of Herbage Plants. (22 pp.) Aberystwyth, 1930. [575.4; 63.1952.]

Wheat

Swanson, W. W., and *Armstrong, P. C.*—Wheat. (320 pp.) Toronto and London: Macmillan, 1930, 12s. 6d. [63.311; 63.311: 198; 63.311: 31; 63.311: 38.]

Canada, Department of Agriculture: National Research Council.—Bulletin No. 14:—Report on Inquiry in Europe regarding the Feasibility of Using Protein Content as a Factor in Grading and Marketing Canadian Wheat. (22 pp.) Ottawa, 1930. [63.311: 198; 63.311: 38.]

Canada, Department of Agriculture.—Bulletin No. 134, New Series:—Overseas Tests of the Milling and Baking Qualities of Garnet Wheat. (98 pp.) Ottawa, 1930. [63.311: 198; 664.6.]

Horticulture

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NOTES FOR THE MONTH

THE following note has been communicated by Mr. H. V. Garner, M.A., B.Sc., Rothamsted Experimental Station :—

Field Experiments

In continuation of the series of conferences that have been held at Rothamsted during recent years, an interesting meeting took place on May 7, when the subject for discussion was the Technique of Field Experiments. Previous conferences have been rather in the hands of farmer visitors in the sense that most of the papers were contributed by them, but the scientific and technical workers had the stage to themselves on this occasion. The gathering consisted largely of agricultural educational and advisory officers, several being Imperial Agricultural Officers on leave in this country. Sir Daniel Hall, whose early work at Rothamsted in connexion with the experimental errors of field trials had opened up this important and fruitful field of investigation, was in the Chair.

Using as his illustration the yield data from the classical uniformity trial carried out by Mercer and Hall at Rothamsted in 1910, Dr. R. A. Fisher gave an exposition of the principles underlying field trials. The major source of error was unquestionably soil variation, working errors in the field being with ordinary care relatively unimportant. The urgent need in field experimentation was the reduction of error and its valid estimation. In discussing results we must be able to pick out those that could not reasonably be ascribed to chance causes. To achieve this it was necessary to replicate the treatments and assign them to the experimental area at random. A further principle was the division of the experimental area into " blocks " each one of which contained a single representative of each of the treatments, the actual position of the treatments within their block being random. While retaining the random principle this enabled gross fertility differences between blocks to be eliminated on calculating the results, with consequent reduction of error.

Prof. R. G. Stapledon followed with an account of the methods used in grassland studies at Aberystwyth. The chief point of interest which called for the development of a special technique, was the effect of the grazing animal on the sward. The most promising method so far developed was the use of tethered sheep. This enabled grazing of any required degree of intensity to be arranged, and also permitted of the high degree of replication necessary in such work. Replication, however, brought its own difficulties, for the amount of botanical analysis required to ascertain the changes in a large number of samples was enormous. The difficulty had been met by estimating the botanical composition of the herbage in place of the usual laborious analysis. Prof. Stapledon claimed that the results obtained in this way by a practised observer checked up remarkably well with the actual figures, and the much larger number of samples which it was possible to deal with justified this plan. The lawnmower, now frequently used in herbage experiments, produced an effect on the turf completely different from that of the grazing animal.

The technique of variety trials as carried out by the National Institute of Agricultural Botany was then described by Mr. S. F. Armstrong, and the practical details in his paper could not but be of great value to those taking up this class of work.

Manurial trials were dealt with from two points of view. Mr. A. H. Lewis of Imperial Chemical Industries, Ltd., in his paper on Multiple Schemes of Field Experiments, gave a very interesting account of the methods employed in carrying out, at a large number of centres throughout the British Isles, simple manurial trials on a uniform system. Three-by-three Latin Squares were used, and these, although of only slight precision taken singly, could yield valuable general results when statistically combined. A small travelling thresher mounted on a lorry had been very successful in dealing with cereal plots—always a difficult problem on the commercial farm. Some interesting results of work of this kind carried out on maize by the firm's representatives in Portugal were also communicated.

Another aspect of the mode of experimentation on commercial farms scattered over a wide area was presented by Mr. H. V. Garner, of Rothamsted, who described the methods used in repeating the rather complex experiments of the Research Station under ordinary farming conditions.

The special difficulties inherent in experiments on fruit and horticultural crops were set out by Mr. T. N. Hoblyn, of

East Malling, and the methods employed to meet them were outlined. The long life of the crop plants, and the extreme variability of the material, made a series of individual records necessary in the case of fruit trees. The weight of crop produced was not the only consideration ; the amount of blossom was a further index of productivity. It was also necessary to record one or more of the various measures of "vigour" which were most suitable under the circumstances. To collect and handle these records and observations expeditiously, ingenious labour-saving devices have been developed, and some of these were described. The horticultural experimenter has special problems which do not trouble those dealing with farm crops ; for example, when series of different trees are included in the same experiment it is difficult to decide whether a uniform or individual system of spraying or pruning should be adopted. On the whole a uniform system was preferable.

Mr. D. J. Watson, of Rothamsted, dealt with the principles and practice of sampling farm crops for estimation of yield. A satisfactory technique had been worked out for cereals that involved only a slight loss of precision. There were, however, gains in other directions, and in particular experimentation with cereals became possible on farms where the individual threshing of small plots was not practicable.

In the discussion which followed, several speakers pointed out that much had been done to improve agricultural practice by the use of comparatively crude methods of experimentation. This is true in new countries, where a manurial treatment or variety may produce striking effects, and straightforward methods have their uses to demonstrate large differences to farmers. For the bringing out of those finer points, which are nevertheless worthy of the farmer's notice, a technique involving the principles laid down in the conference is the safest basis for advisory work.

* * * * * *

Mechanized Farming

AT an important conference of agriculturists held at the South-Eastern Agricultural College, Wye, on April 22 last, three well-known farmers gave instructive accounts of their experience of machinery in large-scale farming. Mr. R. Dudley, Linkenholt Manor, Andover, Hants, dealt with specialized corn-growing in Hampshire, where with two men the farmer cultivated 500 acres of corn, and in the winter ploughed a further 120 acres for his neighbours. The ordinary type of plough has been discarded in

favour of the disc plough. Using a caterpillar tractor, preferred because of its light pressure per square inch, he ploughs round and round the field, which for economical working may be of any size over 35 acres. There appears, however, to be no great advantage in very large fields. Similarly, there are limitations to the size of tractor implements. For seed-sowing he prefers to use three drills abreast to one very wide drill, as the former arrangement adjusts itself better to inequalities in the ground. About 50 acres can be drilled in a day.

For harvesting, the "combine" is used in conjunction with an artificial drier, and as many as 25 acres of oats yielding 300 sacks have been dealt with in one day. His claim that the combine harvester (with drier) is specially adapted for harvesting in a rainy season was amply confirmed by a user of the "combine" from Lincolnshire. It further appears that the "combine" can be regulated to deal effectively with heavy and "laid" crops.

The Hampshire method of saving the straw was to collect it behind the harvester. The straw, the farmer reckoned, paid for the fertilizers. Under this system it was felt that wheat could be grown successfully at 40*s*. a quarter.

So far, however, this trial has only extended over two years, and the precise cropping or rotational system to be followed has not yet been determined. It is hoped to take several corn crops in succession before resorting to a bare fallow. The Lincolnshire farmer already mentioned has certain misgivings about the maintenance of humus in a system of continuous corn-growing, and is experimenting with mixtures of rye grass and trefoil, costing about 5*s*. per acre, for sheep keep, as an intervening crop.

Another problem with regard to specialized corn-growing that may not be so easily overcome in this country as in the Dominions and other competitive countries concerns the supply of labour. Normally, a farmer has to maintain a regular staff throughout the year, and by reason of this he contrives as far as possible to find productive work for his men the year round. This will not be possible under a system where the necessary work is performed, mainly, if not entirely, during the few weeks in autumn and in spring.

Another paper, by Mr. D. R. Bomford, Evesham, dealt with mechanization in mixed farming. The tractor sweep was specially commended for hay harvest, and had also been tried, with promising results, for corn. Instead of an elevator for stacking, what was wanted was a power-driven jib crane

swinging horizontally from its base. Mr. Bomford had several suggestions to make for new or improved machines, *e.g.*, a four-furrow one-way tractor plough; a conveyor feeder for attachment to existing threshing boxes, for which purpose stacks would be built crescent-shaped so that the thresher would occupy the bend and be fed from three different points as required. Threshing, as at present conducted, was much too costly. A complement of three men should suffice for the job. Self-tying straw balers, multi-row potato planters, and implements for attachment to the front of tractors for inter-row cultivation were among other devices suggested.

The use of power in open-air dairying and in corn-growing with which the well-known Wiltshire system is now associated was the subject of a very interesting and practical paper by its inventor and leading exponent, Mr. A. G. Hosier, Wexcombe, Marlborough. The conversion of foul and worn-out corn land to valuable pasture by sowing down with a suitable seed mixture, afterwards fertilized by cow-feeding, was convincingly described. It has been widely taught and believed that pasture-making on land neither in good heart nor absolutely clean is a practical impossibility, but there is ample evidence to show that this doctrine is not universally applicable. Where the land is free-draining and capable in winter of carrying hand-fed stock, a good pasture can be quickly formed in spite of "twitch" and other weeds. Twitch will not stand treading; on the other hand the conditions unfavourable for twitch suit rye-grass and white clover.

By growing cereals for feeding stuffs near the pastures and by stacking, threshing, grinding and storing in the field, Mr. Hosier saves transport which he reckons often amounts to 50 per cent. of the cost of production. He is fertilizing his grass land by the dairy herd, and after a spell utilizing the accumulated fertility for the growing of corn crops. There is no fallow. Peas and oats are grown in mixture for silage. The crop is cut green by the self-binder and stacked in sheaves. Very good silage results, provided the stack is big enough and the crop is not too dry when carted.

Here at least are three farmers, and there are many others, resolutely working out their own salvation, reconditioning and improving their equipment in the face of financial depression, and looking hopefully to the future. Such men are public benefactors.

* * * * * *

THE following note has been communicated by the Meteorological Office of the Air Ministry :—

Weather Forecasts for Farmers

Farmers are reminded of facilities that exist for obtaining, other than through the medium of the daily press, weather forecasts issued by the Meteorological Office.

Forecasts Broadcast by Wireless Telephony.—Weather forecasts for the British Isles as a whole are prepared in the Meteorological Office and passed to the British Broadcasting Corporation for issue at the following times in summer : 10.30 a.m. ; 6.15 p.m. (week-days only) ; 9.0 p.m.

The first of these messages is normally broadcast in the National Programme at 10.30 a.m. daily, including Sundays. It contains forecasts for the next twelve hours for the whole of the British Isles (which may be divided up for this purpose into specified areas), and a further outlook if the conditions are such as to justify the issue of one. A notification of any anticipated spell of fine weather is always broadcast with this message. The forecasts are followed by the general inference that has been drawn from the weather charts, and a forecast for shipping.

The second of the messages is broadcast from all stations of the B.B.C. (*i.e.*, all stations in Great Britain and Belfast, thus including both the National and Regional Programmes) at 6.15 p.m. (Sundays excepted). It consists of a short forecast of the weather of the night and the following day for the British Isles as a whole, with any further outlook, and any notification of an anticipated spell of fine weather that may be issued. The forecast is of a more general nature than that issued at 10.30 a.m.

The third message is broadcast in the National Programme at about 9 p.m. and in the Regional Programmes at about 10.15 p.m. It is of the same general character as the 6.15 p.m. message, and refers to the same period of time, but it is based on later information. On Sundays it is broadcast at 8.50 p.m. from all stations.

It should be noted that the B.B.C. may alter the hours of broadcasting these messages on individual days, but they normally announce any such changes both in the *Radio Times* and from the broadcasting stations.

In addition to the above general issues the following special issues are made by wireless telephony :—

Forecasts for Ireland.—Two daily forecasts for the whole of

Ireland are prepared at 12 noon and at 9.15 p.m. (9.15 p.m. only on Sundays). The first of these refers to the weather of the period 1 p.m. to midnight of the day of issue and the second to the weather of the night and following day. The forecasts are broadcast by the Dublin and Cork Stations of the Irish Free State, normally at 1.30 p.m. and 10.30 p.m. (Sundays, 10.30 p.m. only).

At the request of the Government of Northern Ireland a daily forecast for Northern Ireland is prepared at 8.30 p.m. It refers to the weather of the night and following day, and it also includes a further outlook whenever the issue of one is justified. The forecast is broadcast by the Belfast station of the B.B.C., normally at 9.15 p.m.

Forecasts by Telegraph.—While the above issues of weather forecasts by wireless telephony are ordinarily sufficient for the requirements of farmers, there may be some farmers to whom it is inconvenient to receive the broadcast issues, or who prefer to receive special telegraphic notification of spells of fine weather. For these the following provisions are still in force. Two types of forecast are issued by telegram :—

(*a*) Notifications of the setting in and breaking up of spells of settled fair weather. For such messages when sent during the months of May to September a fee of 6*d.* per message is charged, plus cost of telegraphy ; in other months the fee is 2*s.* 6*d.* per message.

(*b*) Regular daily forecasts covering a period of about 24 hours in advance. When possible an " Outlook " is added covering a longer period. The charge for this service is 1*s.* 3*d.* for each daily telegram in addition to a registration fee of 6*d.* for each week or part of a week for which the forecasts are required.

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County Egg-Laying Trials

THE Millers' Mutual Association has presented a valuable Gold Challenge Cup to the Ministry for award in connexion with county egg-laying trials. The Cup will be presented to the county education authority whose laying trials, conducted under the Ministry's regulations, contain at the end of the annual period four pens of birds (of one breed) which have made a higher score in points than any other four pens (of one breed) in any other county trial.

The object of the Association in presenting this Cup is primarily to encourage the use of British milling offals in

connexion with the trials, but the Association is interested generally in the development of the poultry industry and is anxious to do what it can to assist this development. The rations used at county laying-trials are closely studied by poultry keepers in the respective county areas, and the trials themselves exercise considerable influence in improving the methods of feeding poultry throughout the country. There are now 36 county authorities in England and Wales who conduct laying trials, and the number is increasing every year. Not only do such trials demonstrate the value of good laying strains of poultry as compared with poor strains, but they provide valuable data for the information of poultry keepers and serve as county poultry educational centres. It is interesting to note that, since county egg-laying trials commenced in 1921, the average annual egg yield of all the birds in these trials has increased by nearly 50 per cent. As these birds represent the foundation stock upon which farmers and other poultry keepers in the counties largely rely for new blood, the beneficial influence of the trials is very considerable.

The Gold Cup (illustrated) weighs nearly 2 lb. and is a valuable and handsome trophy. It will be retained for a year by the winning county, and a silver replica will be given by the Association to each holder of the Cup. The Ministry is gratified at the interest thus shown in county trials by the Millers' Mutual Association, and feels sure that this appreciation will be shared by the county authorities concerned. Full details of the conditions of award are given in a circular letter which has been issued from the Ministry to county authorities for agricultural education.

* * * * * *

Sugar Beet Regional Prize Scheme, 1930

THE awards under this scheme were made by the Judges, Sir Daniel Hall, Mr. T. Baxter and Mr. W. J. Atkinson, on April 15. Prizes were awarded as follows in each of 9 Committee's (or "outside") areas and 18 Factory areas for the best crops of sugar beet produced in 1930 :—

Committee's Areas	1st—£10 :	2nd—£5
Factory Areas		
Class A (5 acres and under) ..	1st—£10 :	2nd—£5
Class B (25 acres and under but over 5 acres)	1st—£15 :	2nd—£7 10s.
Class C (over 25 acres) ..	1st—£20 :	2nd—£10.



The Gold Challenge Cup presented by the Millers' Mutual Association to the Ministry for award in connexion with County Egg-Laying Trials in England and Wales.

To face page 210.



These prizes were provided by the Beet Sugar Factories Committee of Great Britain.

The Alfred Wood Championship Cup for the prizewinner who, in the Judges' opinion, had either grown, or made the best effort to produce, the best crop of the year, was awarded to the Spalding Bulb Co., of Spalding, Lincs., who obtained a crop on 41 acres averaging 17·6 tons of washed beet per acre, containing 17·09 per cent. of sugar. In making this award the Judges placed it on record that they were very much impressed by the results obtained by Mr. C. A. West, of Brome, Eye, Suffolk, who succeeded in growing 15·44 tons of washed beet per acre, containing 16·8 per cent. of sugar, on an area of 148 acres.

The prizes were presented to the 129 successful growers by the Parliamentary Secretary of the Ministry, at the Central Hall, Westminster, S.W.1, on April 28, in the presence of a large and representative company. Lord Ernle and Sir George Courthope also addressed the meeting.

* * * * * *

Horticultural Machinery Demonstrations

THE demonstrations of horticultural machinery this spring have been divided into two series, each comprising three demonstrations. The demonstrations in the first series, carried out between the middle of March and the first week in April, were limited to the small motor-cultivators designed for use in orchards and market gardens, and sites specially suited for cultivation by these machines were selected in the counties of Devon, Cornwall and Hampshire.

The second series of demonstrations, which followed immediately and concluded on May 7 and 8, was arranged for the purpose of showing in use the large tractors and cultivating-implements, as well as the small motor-cultivators. A greater number of these machines was shown than in previous seasons, and it was decided, therefore, that each demonstration should cover a period of two days. It is particularly interesting to note that three different makes of disc harrows with special offset attachments for orchard work were demonstrated. This series of demonstrations was carried out at centres in Essex, Norfolk and Lincs (Holland).

The demonstrations were very successful. Excellent attendances were recorded and good work was carried out by the different machines that participated.

Grey Squirrels

A CONFERENCE was held at the Ministry on May 13 to consider the damage caused by grey squirrels to agriculture and horticulture. Sir Charles Howell Thomas, K.C.B., C.M.G., Permanent Secretary of the Ministry, presided over the meeting, at which representatives of H.M. Office of Works, the Forestry Commission and of the following organizations were present :—

The Central Committee of the "Anti-Grey Squirrel Campaign."
The Central Landowners' Association.
The Chartered Surveyors' Institution.
The County Councils Association.
The Incorporated Society of Auctioneers and Landed Property Agents.
The Land Agents' Society.
The National Farmers' Union.
The National Trust.
The Royal Agricultural Society of England.
The Royal Horticultural Society.
The Royal Society for the Protection of Birds.

Invitations had also been sent to the Auctioneers' and Estate Agents' Institute, the Central Chamber of Agriculture and the Land Union.

Mr. A. D. Middleton, of the University Museum, Oxford, gave a brief report of the results of his researches into the spread and the depredations of the Grey Squirrel in this country, and Mr. L. W. Swainson, Hon. Secretary of the Central Committee of the "Anti-Grey Squirrel Campaign," made a statement as to the activities of that body. The Conference expressed appreciation of the valuable work done by Mr. A. D. Middleton and by Mr. Swainson's Committee. After some general discussion, the following resolutions were passed :—

1. That this Conference is of opinion that the Grey Squirrel is a pest which causes extensive damage to agriculture and horticulture, that it is widespread and increasing in numbers, and that it is in the interests of agriculture and horticulture that all possible steps should be taken to bring to the public notice the damage caused by these animals, and the importance of repressing them.

2. That this Conference asks the Ministry of Agriculture to issue an educational pamphlet giving the life-history of, damage done by, and methods of destroying the Grey Squirrel, and to send copies to the various organizations represented at the Conference, and also to all County Agricultural Committees asking them immediately to take all steps within their power to encourage the destruction of this pest.

* * * * * *

AGRICULTURE IN RUSSIA

WIDESPREAD interest has been aroused by the resumption, during the current cereal year, of exports of corn from Russia on a substantial scale; and the importance of the matter prompted the International Institute of Agriculture to undertake an examination of the available data to ascertain the nature of the changes that have taken place in Russian agriculture since the revolution, and the possibilities of further expansion in production and exports of corn. A summary of the results of this investigation was presented to the Preparatory Conference of the Second World Wheat Conference held towards the end of March last in Rome; and, in the following paragraphs, an indication is given of a few of the more important features of this summary, amplified in certain directions by information from other sources.

In so far as Russian industrial activities are concerned it may be said briefly that the revolution resulted in the almost complete transference of control to the State. As regards agriculture, however, control for the most part still remained in private hands, and in consequence it was inevitable that difficulties would arise as between industrial and agricultural interests. These difficulties had several phases, starting with the forced requisitions of agricultural products during the period of so-called "War Communism," followed by the "New Economic Policy" that allowed greater freedom of action to the peasants, while a further phase may be said to have commenced with the putting into operation of "the Five-Year Plan." This Five-Year Plan started with the economic year October, 1928, to September, 1929, and in regard to agriculture the plan provides for what is described as reorganization on a collective basis. The reorganization of agriculture is to be accomplished by the provision of large and increasing supplies of agricultural machinery and fertilizers, in addition to the wide dissemination of technical and other propaganda, while "collectivization" involves the grouping together of the huge number of small peasant holdings. In this latter connexion it may be noted that, according to statistics relating to 1926-27, the total number of peasant holdings was then upwards of 24 million, with an average sown area of only 9 acres. Of these holdings nearly one-fifth had a sown area of less than 3 acres, while at the other end of the scale only on 1·4 per cent. of the holdings did the area under crops exceed 43 acres.

The collectivization of agriculture is being carried on in two directions, viz.: by the establishment of State farms

(sovkhoz) and of collective peasant farms (kolkhoz). Among the State farms a number are organized especially for the purpose of cereal cultivation, to a large extent on fresh land. At the moment there exist 175 of these specialist cereal farms with a total area of approximately 30 million acres. As many as 50 of these have an area of over 250,000 acres each, while 4 exceed 500,000 acres each. It would appear that as yet these farms are not being utilized to their fullest extent, inasmuch as in 1931 the area sown is only expected to be about 13 million acres. That progress has been made, however, is indicated by the fact that the State farms as a whole are estimated to have accounted for 2·8 per cent. of the total area under cereals in 1930 compared with 1·2 per cent. in 1928, while in 1931 the proportion contributed by the State farms is expected to rise to 6·4 per cent.

Collective farms represent groups of individual peasant holdings operated as one farm. In all instances the land is the common property of the peasants concerned, but degrees of difference exist as to the extent of common ownership in the buildings and the live and dead stock, and as to the manner in which the results of the harvests are divided. Rapid increases have been recorded in "collectivization," it being estimated that in 1929 some 15½ per cent. of the total number of holdings were in collective farms, in 1930 about 27½ per cent., while in 1931 the proportion is expected to reach 50 per cent. Moreover, in the principal cereal-growing areas it is anticipated that in 1931 as many as 80 per cent. of the holdings will be in collective farms, and that over the whole country in that year collective farms will contain nearly 41 per cent. of the total area under cereals.

Even before the operation of the Five-Year Plan substantial increases had been recorded in the numbers of tractors in Russia, the total rising from under 3,000 in 1924 to nearly 32,000 in 1928. The majority of the machines were imported, the number manufactured in Russia being less than 4,000 in 1928, although it is anticipated that in 1932 it will be possible to provide nearly all the tractors required from home manufacture. In 1930 the power of the tractors available for agriculture was estimated at 900,000 horse power, while the corresponding figure for 1931 is stated to exceed 2 million horse power. For the most part these tractors are put at the disposal of "tractor-centres," which contract with collective farms to do their ploughing, sowing, harvesting, &c. In payment the tractor-centres receive one-quarter of the

harvest, and in addition the collective farm has to undertake to deliver to the centre, at prices fixed by the State, the surplus balance of the harvest after deduction of any amounts required for food, &c., on the farm. According to the Five-Year Plan, by the spring of 1931 these tractor-centres were to number 1,105, with machines developing 692,000 h.p.

While the use of artificial fertilizers has made considerable progress it is still relatively limited, the total amount utilized being estimated at 665,000 tons in 1929-30, compared with 216,000 tons in 1927-8. At the same time it is anticipated that by the development of home resources the figure in 1931 will be increased to 2,400,000 tons.

In the foregoing paragraphs an attempt has been made to furnish a broad outline of the changes that have taken place in Russian agriculture in the direction of State control, and of the efforts that are being made to increase productivity and total yield. It now remains to deal with the actual area and production of cereals in Russia and the possibilities of the future.

The total area of Soviet Russia may be roughly classified as follows :—

	Millions of acres	*Proportion of total* Per cent.
Arable Land (including gardens)	455	8·4
Permanent Grass	247	4·6
Forests	1,472	27·3
Other Productive Land	99	1·9
Total Productive Land	2,273	42·2
Unproductive Land	297	5·5
Land not used for Agriculture	2,131	39·5
Land not classified	689	12·8
Total	5,390	100·0

Rather over 40 per cent. of the total area falls under the heading of productive land, but of this nearly two-thirds is under forests, arable land representing somewhat more than one-half of the remainder. The bulk (about 370 million acres) of the arable land lies in the black soil belt, but the total area of this belt is estimated to be approximately 620 million acres, and there are, therefore, considerable possibilities of an extension of cultivation. At the same time it is necessary to remember that climatic conditions in large areas of the black soil belt are by no means very favourable for corn growing, inasmuch as the rainfall is often inadequate and periodic droughts occur. The remainder of the land included

in the table above under the last two categories would appear, as a whole, to be unsuitable for crops, although in some degree lending itself to stock-raising.

Apart from the possibilities of increasing production by the cultivation of fresh land, it is of importance to note that over the greater part of Russia the predominant rotation is one of three years, with the land lying fallow every third year. In consequence, about 30 per cent. of the arable area in the above table is fallow land, and the general adoption of a more modern system of farming would obviously enable the total output to be increased irrespective of any extension of the total area.

The progress that has so far been made in increasing the sown area is indicated by the following table :—

	Area sown—millions of acres			
Year	*Cereals*	*Industrial Crops*	*Other Crops*	*Total*
1925	220·1	17·7	24·8	262·6
1926	235·7	16·7	25·0	277·4
1927	239·8	17·8	26·5	284·1
1928	227·7	21·3	36·9	285·9
1929	237·2	21·8	38·3	297·3
1930	252·0	26·4	43·8	322·2

Over the whole period the area sown has risen by nearly 60 million acres or about 23 per cent. Rather over one-half of the increase in area has occurred in cereal cultivation, although it may be noted that proportionately by far the heaviest gains have been recorded in industrial and other crops. During the last two years shown in the table the rate of increase has tended to accelerate, a circumstance which must presumably be attributed to the operation of the Five-Year Plan, and in 1931 the total sown area is planned to reach 353 million acres of which cereal crops are to comprise 274 million acres.

According to Russian computations the area and production of the principal crops in 1930 were both much in advance of the 1913 level, with the single exception of barley. Much of the increased area under cereal crops has been devoted to wheat-growing, the area under wheat having risen from some 63 million acres in 1925 to 86 million in 1930. Further notable extensions to the wheat area are planned, and the total is to be increased to 101 million acres in 1931 and to 113 million acres in 1932. The area under barley, oats and maize has also been extended, but in the case of rye the area has been reduced. In 1929 some 64 million acres were under

rye, 46 million under oats, 20 million under barley, and 9 million acres under maize.

The total yields of the principal cereal crops are given below :—

	Production in millions of cwt.				
Year	*Wheat*	*Rye*	*Barley*	*Oats*	*Maize*
1925	419	453	115	239	86
1926	489	471	105	306	66
1927	416	481	89	262	68
1928	432	376	108	324	65
1929	382	398	145	327	83
1930*	553				

*The figure for wheat, which is provisional, is the only one so far available.

The table shows clearly the very marked increase that took place in the production of wheat in 1930, although before that year the rising area under wheat was not reflected in heavier production, owing to variations in the average yield per acre. In 1925 and 1926 the average yield of wheat per acre over the whole country was 6·6 cwt., but in 1927 it dropped to 5·3 cwt. per acre, and while the next year showed a recovery to 5·9 cwt., in 1929 there was a further reduction to 5 cwt. per acre only. The average yield in 1930 at 6·4 cwt. was again good, although slightly inferior to the yields of 1925 and 1926. Thus during a period of six years the highest figure was nearly one-third more than the lowest. Equally noticeable variations have occurred in the average yields of barley, oats and maize, although the yield of rye has been decidedly more stable.

With regard to other crops reference may be made to the important extensions that have been planned to take place in the areas devoted to sugar-beet, cotton, flax and tea. During 1931 the area under sugar-beet is to be raised to $3\frac{1}{3}$ million acres, which would represent an increase on the year of 31 per cent. The probable production of beet is put at about 21 million tons, with a yield of very nearly $2\frac{1}{2}$ million tons of raw sugar as against less than $1\frac{3}{4}$ million tons in the preceding season. Efforts are to be made to provide more beet-drying plants, and it is hoped thereby to extend the sugar-making season to 155 days compared with 80 to 120 days in recent seasons. The area devoted to cotton in 1931 is to be 5,700,000 acres, from which nearly 2 million tons of raw cotton are to be obtained, or nearly one-half as much again as the corresponding figure for 1930. The probable output of cotton fibre is put at about 660,000 tons. Compared with 1930 the area under flax is to be increased in 1931 by 14

per cent. to 5,200,000 acres, and in consequence it is anticipated that the output of flax fibre will rise from 410,000 tons to 560,000 tons. In regard to tea it is proposed to plant in 1931 a further area of 33,000 acres and to prepare an additional area of 39,000 acres for the same purpose. State tea farms are to be organized on a large scale.

Turning to the live-stock side of the agricultural industry the situation disclosed by the following figures of numbers of live stock in Russia is in marked contrast to the position in arable farming.

	Livestock in Russia (millions of heads)			
Year	*Horses*	*Cattle*	*Sheep*	*Pigs*
1916	35·8	60·6	113·0	20·9
1924	24·7	56·7	95·1	21·3
1927	31·1	68·2	126·8	23·2
1928	33·5	70·7	133·6	26·1
1929	34·6	67·2	134·0	20·5
1930	31·2	53·8	100·6	13·2

Marked increases were recorded between 1924 and 1928, and in the latter year the numbers were, with the exception of horses, well above the totals in 1916. In 1929 further slight increases occurred in horses and sheep, but cattle and pigs declined in number, while in the next year all classes of live stock suffered heavy reductions. As a result, the numbers of cattle and pigs in 1930 were much the smallest of the years covered by the table, while sheep were only slightly more numerous than in 1924. In commenting on these figures the International Institute of Agriculture ascribes the reductions mainly to the policy of collectivization, as a result of which the peasants slaughtered or sold for slaughter large numbers of animals. At the same time the Institute points out that fodder crops were poor in 1929 and in some areas in 1930 also.

It would appear that the Soviet authorities are taking steps to deal with the situation partly by restricting the slaughtering of young stock, and partly by establishing special State and collective farms for stock-raising. In the latter connexion it may be noted that in 1931 the numbers of live stock on State farms are to be raised to 2,800,000 cattle, 4,400,000 sheep and 1,900,000 pigs, and those on collective farms to 4,000,000 cows, 9,000,000 sheep and 5,000,000 pigs (inclusive of 1,300,000 breeding sows).

Apart from the effect of any measures that may be taken to rehabilitate the live-stock industry, it will be clear from the earlier paragraphs that strenuous efforts have been and

are being made to increase the cultivated area, particularly in regard to wheat growing. Moreover, the possibilities of extension appear to be considerable, partly through the breaking up of fresh land and partly by a modernization of the rotation. Probably of equal importance are the measures that are being taken to stimulate productivity by the increased use of machinery and fertilizers, and by the dissemination of propaganda. While variations in the yield per acre are marked, it is impossible to resist the conclusion that under normal climatic conditions large increases in output must be expected if the present programme is carried through. At the same time, in so far as exports are concerned it is necessary to remember that Russia has a rapidly increasing population—it rose from 132 millions in 1922 to 154 millions in 1929 and 158 millions in 1930—and that the consumption per head of the bread-making cereals, wheat and rye, is computed to be still somewhat below the pre-war level.

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THE HARVESTER-THRESHER IN ENGLAND

IT is now nearly fifty years since the first harvester-threshers were constructed in the United States of America and in Australia. It was not until the early years of the twentieth century, however, that the new machine was definitely accepted by the farmers of those two great countries. Thereafter it soon became established as an indispensable part of the equipment of corn-growing farms in dry areas, and has been gradually accepted in districts where climatic conditions and the resulting comparatively late harvests were at first held to present insuperable difficulties. Since the War large numbers of harvester-threshers have been purchased by farmers in the Great Plains area of the United States, and in the wheat-growing areas of Canada ; the Australian and Argentine wheat growers have adopted them ; and Soviet Russia has recently placed a large order for harvester-threshers for use in the development of the " Five-Year Plan."

When all these, the main wheat-growing areas of the world, have accepted this machine as a useful and economic addition to the equipment required for cereal cultivation, we, in England, must consider very carefully whether it cannot usefully be adopted in the corn-growing districts of this country. Various arguments have been put forward against its use under English conditions, but, until full trial of the machine has been made, these arguments must be mainly

theoretical, and it is meanwhile interesting to record that during the past three harvests, harvester-threshers have been tried with satisfactory results by a number of farmers in different districts in England. It is their experience and the results of demonstration work carried out by the Ministry and by the Institute of Agricultural Engineering that are summarized here.

It was suggested in 1917 during the intensive campaign of the Food Production Department that a harvester-thresher might be introduced into this country for trial, but the suggestion was not favourably received by the manufacturers, and a period of 10 years elapsed before, owing to the enterprise of Messrs. Dunn, Flamsteadbury Estates, near St. Albans, a machine was imported and put to commercial use. It is interesting also to recall that a machine was exhibited at the British Empire Exhibition at Wembley, but this did not result in any sales to British farmers. In 1927, not only was an International Harvester-Thresher introduced by Messrs. Dunn, but a Massey-Harris machine was purchased for experimental purposes by the Institute of Agricultural Engineering. This latter machine was adjusted to a small cut and was used quite successfully to cut and thresh wheat and barley in 1928: the work was done at Rushall Farm, Wiltshire, and has been fully described in a Report issued by the Institute.*

In the 1929 harvest the Institute demonstrated their machine again on the same farm in Wiltshire, and a second machine of the same make, but taking a larger cut, on a farm in Hampshire. A Caterpillar harvester-thresher, manufactured by the Caterpillar Company of California, was also shown at the same time in both these counties. During the same harvest a machine manufactured by the well-known English firm of Clayton and Shuttleworth was operated with success on the Londesborough Estates in Lincolnshire.

The Institute's Massey-Harris machines used in these demonstrations were employed, the one to cut barley in Hampshire, and the other to cut both barley and wheat in Wiltshire, where the gradients of the field were very steep, in parts 1 in 4. In the judgment of those who were present the work was, nevertheless, well done. The Caterpillar did the same class of work in both places with equal satisfaction

* Bulletin No. 3, Report of Trials of the Combine-Harvester-Thresher in 1928, by J. E. Newman and J. H. Blackaby, B.Sc. Price 2*s*. 6*d*. net.

to the observers. It was anticipated that difficulty would arise owing to the high moisture content of grain harvested under normal conditions in England. This difficulty can easily be exaggerated, but as a measure of precaution in these as in other demonstrations of harvester-threshers arranged by the Oxford Institute, a drying apparatus was installed at each demonstration centre. The dryer was, however, not required in 1929 for some parts of the crop cut.

The Clayton & Shuttleworth machine was built for the Argentine and, having a 12-foot cut, was rather larger than either of those shown in the south-western counties. It cut and threshed both wheat and barley in a satisfactory manner. The season was, of course, particularly favourable from the point of view of the weather, and 20 acres of wheat were cut in six hours. The grain was carried straight off the field to the mill, where its moisture content was found to be 17·40, and its condition was so good that some of it was made into biscuits on the following day.

At the 1930 harvest the Ministry itself arranged, with the collaboration of the Institute of Agricultural Engineering, a demonstration of harvester-threshers on the Lincoln Heath. It was not possible to secure a Massey-Harris machine on this occasion, but the Ministry was able to demonstrate once again the English machine improved to suit English conditions, and a new type of International of smaller construction. The latter machine is particularly interesting in that the threshing and cutting mechanism is driven with a power take-off from the tractor. A Caterpillar harvester-thresher belonging to Mr. Geoffrey Nevile, of Wellingore Hall, was to be seen at work at the same time.

The International power-drive machine attracted a good deal of attention. The power take-off removes the necessity for the engine on the machine itself, and thus reduces the prime cost. This machine gave a good performance in a crop of oats and in barley. The Clayton & Shuttleworth was hauled by a Marshall Diesel tractor. It dealt with a large crop of barley on the Stubton Estates in a satisfactory manner, in spite of bad weather and the difficulties caused by an abnormal growth of clover and green stuff. It was also used in wheat, and its performance favourably impressed a large gathering of farmers and landowners. The Clayton & Shuttleworth is a finishing thresher, like the Marshall & Clayton stationary machines.

Between August 14 and October 1 the Caterpillar (10-foot

cut) dealt with 165 acres of barley, 25 acres of wheat and 40 acres of oats. The season was very catchy, there being rain on 32 of the 50 days, but the barley was harvested in good condition and obtained the highest price paid in the district for malting barley. A dryer was used, and the grain was put through either immediately after harvesting or later as was found to be most convenient.

In addition to the information gleaned from the work done at these demonstrations, the Ministry has also obtained brief reports on four other machines that were worked on different estates in the 1930 harvest. One of these is the International machine owned by Messrs. Dunn, to which reference has been made above. It dealt with 53 acres of winter oats between August 5 and 16; 42 acres of wheat, August 18-27; 20 acres of spring barley, August 28-29; and a further 45 acres of wheat in the course of the season. The yields were passable, the wheat and oats averaging 5 qr. and the barley 4 qr. per acre. The wheat was laid and difficult to handle, and in some cases the awns clogged the sieves, but on the whole the machine gave satisfaction. The barley was harvested most effectively. A dryer, supplied by Messrs. Hall & George of Wellingborough, was installed, and dealt with the wheat as fast as it was threshed. The owners are well satisfied and are continuing to use the machine. It may be mentioned that during 1929 they successfully used their harvester-thresher to harvest linseed, mustard and sainfoin.

Mr. A. F. de Ledesma, of Popham, Hampshire, owns a Massey-Harris and has used his machine in different ways. In 1930 some 40 acres of oats, rye and wheat were harvested direct and dried by a cold-air blower, or spread on a floor; a further 135 acres—including 15 acres of peas that had been windrowed by hand—were first cut and left in the windrow, and were later taken up and threshed by the harvester-thresher to which a pick-up attachment had been fitted. Of the wheat some was threshed as it stood in the field and was sold by September 30 last; 30 acres that had been cut with a binder were carried to the harvester, which was used as a stationary thresher; while 20 acres were stacked to be dealt with later. No difficulty of any sort was encountered. The estimated cost of this work ranged between 5*s*. and 15*s*. an acre and the rate of workng from 10-20 acres a day. Mr. de Ledesma thinks that the heavier crops (over 30 bushels an acre) should be cut and laid in windrows before threshing, when the harvester-thresher with pick-up would be used.

A large International was used on the farm of Major Proby at Hundon, Clare, Suffolk. Here the machine was used in 35 acres of wheat, some of which was rather badly laid, but in spite of unfavourable conditions it was found possible to sell the grain from the field to a mill at the current market price. Major Proby has not installed a dryer, but thinks one is necessary if the combine is to be used regularly. He expects to make greater use of the machine this year.

Mr. R. Dudley, of Linkenholt Manor, Andover, has a fully mechanized farm and has used his caterpillar harvester-thresher consistently. His actual running costs were in the neighbourhood of 3*s*. an acre, but this does not include cartage, nor does it include depreciation, as Mr. Dudley considers that too little is yet known about the behaviour of the machines in this country to enable this to be estimated with safety. The machine harvested direct 48 acres of wheat and 42 acres of oats, and threshed with pick-up from the windrow 85 acres of wheat and 12 of barley.

Another estimate of costs which has been submitted to the Ministry is one of 12*s*. an acre, including cartage, the stacking of the straw and depreciation, but all such estimates must at present be accepted with reserve.

All users of the harvester-thresher have declared themselves satisfied with its performance, but still more experience will be useful. The work done in 1930 showed that the advantages of harvester-threshers, which make possible the speedy harvesting of large acreages, are in a wet season even more pronounced that in the hot, dry seasons like those of the previous two or three years. On a good many days, the use of harvester-threshers enabled work to begin at an earlier hour than under the older methods, because standing corn dries much more quickly than corn in the stook; moreover, a harvester-thresher starting at noon can cope with about 16 or 17 acres before sunset, and the corn is safely stored in the barn, no part being left out to be exposed to further heavy dews, and possibly stormy nights such as were common in 1930.

The Ministry proposes to arrange for a further demonstration of harvester-threshers during the coming harvest; early notification will be given of the time and place at which it will be carried out.

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B.B.C. TALKS ON PIG-KEEPING.—I.*

Sir DANIEL HALL, K.C.B., LL.D., F.R.S.,
Chief Scientific Adviser, Ministry of Agriculture and Fisheries.

PIG-KEEPING is one of those matters on which people are always exhorting the British farmer. We buy from the foreigner little less than £50 millions worth of bacon and other pig products every year. Why should we not produce this at home, whereby we should give employment to more than 50,000 men? From 1872 down to the War the pig population of Great Britain remained fairly constant at about two and a half millions. There was a big reduction towards the close of the War because the pig needs food that was then wanted for men, but since the War there has been a brisk turn upwards and the numbers have risen to nearly three millions. But in Denmark the pigs which in the 'seventies only numbered about half-a-million have risen to nearly five millions, the produce of which is almost wholly destined to the British market. I will not attempt to discuss why we should so have stood still when in touch with a growing market, but I will call your attention to the fact that Scottish farmers keep only about 7 per cent. of the number of pigs there are in England, and fewer than there are in Wales. This would seem to indicate that there has been some element of doubt about pig-breeding as a steady money-making business.

In a way one can argue that pig-rearing is not farming at all, but a manufacturing business in which foods like barley meal and millers' offals are converted into pig-meat. It does not need any land except a run for the sows, and several times of late years, and certainly at the present time, the necessary food has been purchasable more cheaply than it can be grown. I have known farms which in particular years had made both ends meet from the sale of milk and pigs and eggs, but in which it would have been more profitable to have given the land away except for some fifty acres of exercising ground. As farming, pig-keeping used to be a side line useful to the corn grower and the cheese maker, as a means of turning to use the tail corn and the whey. That is where the Danish farmer has scored. He is a dairy farmer who cannot sell fresh milk, but has to turn it into butter. The separated milk is available for the pigs as the best of all supplements to the barley meal or offals which he can buy almost as cheaply as the English farmer.

But I want to talk of pig-rearing as an independent business

* This Broadcast talk was given on February 4 last.

—of the possibility of turning some of this flood of imported corn, of the cheapness of which we are only too unhappily conscious, into saleable meat. It is a perfectly level competition between Danish and British farmers; if the Danes have a little pull in the matter of separated milk, we now know that it can be replaced, while the cereal foods are a trifle cheaper here and we have less carriage to pay on the finished product.

First of all as to breed. There are 13 breeds of pigs recognized in Britain, though at bottom there is need of no more than one. Diversity of breed should reflect diversity in conditions or differences in the product aimed at. We have mutton sheep and wool sheep, sheep for the pastures of Romney Marsh and similar fat grazings, others for the Downs or the wet, high lands of Wales and Scotland, and sheep again for the arable land. But all pigs are kept indoors under much the same conditions; even the differences between the requirements for pork or bacon are comparatively trifling. Hence our multiplicity of breeds is detrimental to business. It interferes with the standardization of products which the market wants, especially as in some breeds features undesirable to the bacon curer have been encouraged.

To a large extent we can neglect breed points and think wholly of profitability and market requirements. Of course, I do not mean that any sort of a mongrel will serve for commercial pig-breeding; we have got to select very rigorously for the qualities we want, but there is no evidence that they are special to any one breed. We may take it as settled that the market wants a white pig, or at any rate a nearly white one. I am sorry about this, for, as a matter of personal taste, I like black pigs, whether the shapely Berkshires or the deliberate Large Blacks, and those neat brisk half-breeds between the two. I have every sympathy with the old Berkshire farmer's cure for all the ills that were creeping over England—"More o' they black pigs and fewer black coats." But the bacon curers are quite determined that they do not want black pigs, which are apt to produce a certain amount of unsaleable bacon, the so-called "seedy cut," on the flank, and it is useless to run against the market merely to satisfy one's feelings about the look of the pigs. The same objection does not lie against the black and white half breds that result from crossing Large Blacks or Berkshires, or any of the part black breeds with a Large White sire, so that the black races are not entirely condemned. There is very distinct evidence that the rearer of pigs, the man who is working for the pork

market or the bacon factory, will get better results with first cross pigs than with any pure breed. The vigour of first crosses is, of course, generally recognized, and there are experiments with pigs that have demonstrated that first crosses grow more rapidly and so attain standard weights on a lower expenditure of food than the pure-bred parent races. Of course, the maintenance of a continued supply of cross breds interferes with the work of the pig-breeder who wants to be continuously selecting his strains. He has to keep two boars, one for crossing purposes, and one to replenish his stock of pure bred sows, for he must raise a proportion of pure-bred gilts each year to take the place of the sows he casts for age or other defects.

It is essential that the commercial pig-raiser should breed his own foundation stock and not trust as a regular practice to buying in gilts to breed from. Not only is there the risk of introducing disease—and the pig rearer cannot be too cautious in keeping his pigs away from any contacts (I would even discourage visitors)—but the buyer can at present have little guarantee as to the constitution and prolificacy of the stock he buys. Whatever the breed, variation is very great in these respects, and the pig rearer who is building up a permanent business must by continuous selection establish his own strains of sows that can be trusted to bring up profitable families. This task is increased when crossing has to be practised, because the pure-bred families from which the selection of the sows has to be made are only a fraction of the total stock bred. Still, the breeding of the pig is so rapid that it is not too difficult to select and maintain a foundation pure-bred strain, even though crossing is the general practice in the herd.

But whatever the breed of sows selected, all authorities agree that the boar should be a Large White. On this point we have not only home experience to guide us, together with the strongly expressed recommendation of all the bacon curers, but we have the example of those countries—Denmark, Holland and Sweden—who supply us with the bulk of the imported bacon. These countries have built up their herds from their local white races by crossing with Large Whites bought in England, and more and more do they incline to leave the local breeds and keep to selected strains of the Large White only. From the Large White can be bred the long lean pig, light in the shoulder and fine in the bone, which the bacon curer wants. The Large Whites are at least equal to other breeds

in rapidity of growth, economy of feeding and prolificacy, though the latter point is with any breed a matter of strain rather than of breed. Nor is the Large White sire unsuitable to the pork trade. There is plenty of evidence that the man who wants to be ready to sell porkers or baconers according to the way prices are running in the market can be well suited by the Large White cross. At 5 score weight or so, he can get full price as porkers, or he can carry them on to baconer weight whenever there is a further profit to be made.

The supporters of the compacter breeds like the Berkshires or the Middle Whites often insist on their earlier maturity and greater value for the porker trade, but definite evidence is lacking that these breeds can actually produce better market returns. Unfortunately, there has never been any real large-scale experimental work on the fattening of pigs of different breeds and strains such as would lead to records and pedigrees of performance. At present there is nothing done with pigs to compare with the egg-laying competitions which have established the leading position of the White Leghorn fowls and have picked out certain strains among them. In the absence of such accurate testing it can only be said that the superiority claimed for the Berkshires and Middle Whites, either pure or crosses, for porker production is not sufficiently large to stand out among the variations due to individuality or to differences in feeding and management. Different strains within the same breed will vary in results just as much as different breeds. It is to be hoped that experimental work of such practical importance will not long be delayed.

But granting the necessity of the Large White boar, what breed of sows shall be selected ? Of course many will maintain that there is no need to go outside the Large White breed, of which a pure bred herd will answer as well as any cross. Since selection among the sows is more important than breed, by careful selection of the Large White sows and mating with boars as widely unrelated as possible the breeder may attain pretty well as good results as would come from a cross. But there must be selection among the Large Whites themselves ; they should be long, lean, round rather than deep, light in the shoulder and fine in the bone, and it is not always the prizewinning types that carry these qualities. The bacon curers say they want a pig like a drain pipe.

However, supposing the pig rearer determines on cross breds, he has a wide choice and can to a large extent back his fancy. In the absence of exact comparative trials I am not going to

attempt to balance off Berkshires and Middle Whites, Large Blacks against Tamworths, Essex against Wessex; the point is that once the breed has been picked the work of selection must begin. The sows will soon show differences in the number of piglings they rear to the weaning stage, and all these qualities of prolificacy, freedom of milk, constitution, even tendency to overlie their offspring, are to a greater or less degree inherited. Fecundity is perhaps the greatest variable, and no pig-breeding can be really satisfactory until an average is attained of 12 pigs *sold* per sow per year. That may seem a modest enough figure, but rarely is it attained when the performance of the whole herd is strictly recorded. So only the sows that give the best records should be bred from to get the gilts for the continuance of the herd. I have known a herd in which eventually every sow has descended from one single sow, who had the capacity for passing on to her progeny, generation after generation, her own thriftiness. Needless to say, in this selection all fancy breed points will be ignored; the selection should be solely for conformation and fecundity and constitution in the widest sense of the word, and it will not matter a rap, for example, whether the orthodox sheeting of the Essex expands or contracts or wanders about the carcass. General conformity to the breed type will be secured by the unrelated boars, which must be constantly brought in for the purpose of maintaining the foundation stock. But I hold that pedigree breeding cannot be combined with business pig-rearing: the ordinary man must specialize one way or the other.

Some care should be given to the choice of a site for the breeding sties. It should be dry, airy but sheltered, and fully exposed to the sun. I have known continual trouble with what looked like a model set of sties, all because they were located in a little hollow down which drifted the cold air on still nights. No elaboration of construction is required; indeed, if it were not for the convenience of a fixed water supply and a concreted path for the food trolley, I should like to shift the breeding sties to fresh ground every year. Some of the healthiest and most effective breeding sties I have known were constructed of a double row of poles with six inches of straw between and a thatched roof; and the warmest floor I have seen in a permanent construction was paved with hollow bricks over which a layer of cement was floated.

The sows when breeding should have access to a fair area of grazing, however rough, with either a yard where they can lie soft and sheltered at night or similar shelter in the field.

Later I shall have more to say about the open-air system of pig-keeping, but without doubt the sows must be able to range and graze before they farrow. The sows come into the sty to farrow, and each sty should have a little yard in which the pigs can lie dry in the sun; but it is perhaps a counsel of perfection that the little pigs as they get older, but before they are weaned, should be able to range over a section of clean grass. Still, up to the time of weaning everything that makes for sanitation and cleanliness is a help towards large and healthy litters, the foundation of all profitable pig-keeping.

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INTERNATIONAL WHEAT CONFERENCE, ROME

THE Preparatory Conference of the Second World Wheat Conference was held at Rome on March 26 last and subsequent days. Delegates attended on behalf of forty-six countries, including all the important wheat-producing countries, with the exception of the United States. The latter country was, however, represented by two unofficial experts invited by the International Institute of Agriculture.

The Delegation of the United Kingdom was constituted as follows: H.M. Ambassador at Rome, His Excellency the Rt. Hon. Sir Ronald Graham, G.C.M.G., G.C.V.O., C.B., head of the Delegation, Sir A. Daniel Hall, K.C.B., LL.D., F.R.S., Chief Scientific Adviser to the Ministry of Agriculture and Fisheries, and Mr. C. Nathan, Principal in charge of the Ministry's Statistical Branch. In addition, Mr. Alexander Slater, President of the Liverpool Corn Trade Association, was present as an expert on the invitation of the International Institute, while Sir Herbert Robson, K.B.E., also attended as a representative of the London Corn Trade Association.

The proceedings were opened by His Excellency Signor Mussolini, and short formal addresses were then delivered by the principal delegates of Argentina, France, the United Kingdom, Hungary and Roumania, and by the representative of the League of Nations. After the appointment of His Excellency M. de Michelis, the President of the International Institute of Agriculture, as President of the Conference, a general discussion, lasting several days, of the problems before the Conference took place. During the discussion, in the

course of which a considerable number of delegates expounded the views of their respective countries, it soon became clear :—

(*a*) that the claims of the exporting countries of Eastern and Central Europe for preferential treatment for their wheat would be unacceptable to the overseas exporting countries, and to a number of free trade importing countries of Western Europe ;

(*b*) that there was no hope of any general compulsory reduction of the wheat area ;

(*c*) that there was general agreement that a somewhat higher price for wheat would be of advantage not only to exporting countries but also, in the long run, to importing countries.

In the course of the discussions Sir Daniel Hall spoke on behalf of the United Kingdom Delegation, and stated that His Majesty's Government viewed with grave concern the continued fall in the price of wheat which had created so grave a situation not only for so many farmers in Great Britain, but also for farmers in the Dominions as well as those of Eastern Europe. On the other hand, the speaker pointed out, with regard to any system of preferential agreements between these eastern exporting countries and countries of Western Europe, H.M. Government must reserve its opinion, especially if any interference with the most-favoured-nation clauses is proposed. In continuation, Sir Daniel Hall said that while there had unquestionably been an abnormal surplus production of wheat in 1928, it was doubtful whether the average production was in excess of requirements. On the average of recent years, production has only kept pace with the growth of population, and the recent break in wheat prices was to a large extent part of the general economic depression. Any artificial restriction of production might therefore result in a dangerous scarcity should crop failures occur simultaneously in more than one exporting country. The remedy for the present crisis was an improvement in the general economic situation with a consequent increase of wheat consumption, the removal of the various barriers to wheat importation existing in many importing countries, and the stimulation of the demand for wheat in the Orient.

On the conclusion of the general discussions the Conference resolved into the following three Committees :—

(*a*) Production and Trade.
(*b*) International Agricultural Credit.
(*c*) Preferential Tariffs.

When the work of the three Committees was completed, a draft Final Act was prepared for submission to the Plenary Conference. The resolutions embodied in the draft Final Act were approved by the Conference after slight amendment, and the text of the resolutions in their final form is appended :—

I.—INTERNATIONAL ORGANIZATION OF WHEAT PRODUCTION AND OF THE WHEAT TRADE

(1) The International Preparatory Conference of the Second Wheat Conference recommends examination of the possibility, in countries where wheat is already consumed, of considering the means of developing such consumption. It also recommends a strong publicity campaign in order to popularize the consumption of wheat in countries where it is not at present largely used. It is of opinion that in order to give full effect to this publicity, it would be desirable to sell off, at low prices in such countries, part of the stocks which overburden the world market.

(2) It recognizes that the European countries, for manifold reasons, economic, social or political, are unable either to give up the cultivation of wheat or to allow it to be neglected.

(3) It recognizes that it is impossible to secure a general reduction in the areas sown throughout the world by the direct method of obligatory restriction, whether advocated by an international body or by national bodies.

It is convinced that the reduction of sowings can only be obtained by natural methods, by the farmers themselves, influenced by the conditions of the market and a study of the figures and of the facts.

It recommends that in countries which consider it advisable this influence should be reinforced by an educational propaganda among the producers.

(4) The Conference considers that, in order to secure the solution of the wheat crisis, it is particularly necessary that there should be an improved organization of the wheat market. Such organization should be brought about rather by a gradual and progressive policy, based step by step on the results obtained, than by any policy that claims to cover every aspect of the problem.

In order to reach a rapid solution, it recommends the countries interested to concentrate their efforts for the present on some particular definite and limited object, such as the disposal or the organization of the carry-over of existing stocks.

(5) The Conference is glad to note that the wheat exporting countries, Overseas and European, have decided to draw up together a scheme to deal with the wheat export season 1931-32 and with existing stocks, and that they will meet for this purpose, under the presidency of the Hon. George Howard Ferguson, High Commissioner of Canada, in London, on May 18.

(6) At the same time the Conference recommends the different buyers in those importing countries where the need should make itself felt to endeavour to form organizations for the purchase of imported wheats. Such organizations may take any form whatever which may be suitable in view of the particular situation in each country.

(7) The Conference considers that the International Institute of Agriculture and the Economic Organization of the League of Nations should follow closely the efforts to be made by the various countries

in the sphere of wheat production and trade, in order to be in a position to take in full agreement such steps as current experience may suggest.

(8) It considers that the improvement of the organization of world wheat production and trade largely depends on an improvement in the provision of information and of statistical forecasts.

It expresses its confidence in the International Institute of Agriculture as a means for co-ordinating the statistical data of the various countries in this respect, for checking and interpreting the figures, for supplementing the documentation from official sources by such professional or commercial documentation as may throw light on the problem, for facilitating the utilization of statistical information and for making it available without delay to the interested parties.

The Conference recommends all the States to increase the financial resources available for the International Institute of Agriculture, in order to enable the Institute to carry out this work to best advantage.

II.—INTERNATIONAL AGRICULTURAL CREDIT

(1) The Preparatory Conference of the Second World Wheat Conference has examined with special attention the part which a systematic organization of agricultural credit can play in improving the general situation of agriculture and, in particular, in overcoming the grain crisis.

It is of opinion that it is more than ever necessary to be able to obtain for farmers, and in particular for wheat growers, at low rates of interest, the capital of which they have need, and that, with that object, it is desirable to examine, from an international point of view, the question of agricultural credit, which differs from commercial credit in the forms imposed upon it by the special conditions of agricultural production.

(2) With regard to medium term and long term credit, which serves principally to enable farmers to purchase equipment and stock, to acquire or to enlarge a holding, to carry out land improvement and to effect transformations in systems of cultivation, in order to restrict, when desirable and possible, the area sown to cereals and to develop the cultivation of crops which can advantageously replace them, the Conference is pleased to learn that the Financial Committee of the League of Nations, taking account of the studies made by the International Institute of Agriculture, is at present contemplating the formation of an international mortgage credit institution.

It expresses the wish that this organization should as quickly as possible be in a position to supply, at the most favourable rates, medium term and long term credit to the farmers of all countries.

The Conference is of opinion that medium term and long term credit are as useful to corporate bodies as to individuals and that it should also serve to facilitate the construction of elevators, of silos and of co-operative warehouses, and the organization of co-operative societies for the marketing of grain and of other agricultural products.

The Conference points out that medium term credit can also be useful to farmers who are not the owners of their farms as, in default of mortgages, they can give other effective security, such as agricultural warrants, liens on crops, sureties, or joint and several guarantees.

(3) The Conference notes that in the present crisis, short term agricultural credit is of particular importance and that it should be encouraged as much as possible by the Governments of the different countries.

This form of credit, in fact, can enable farmers and particularly grain growers to avoid hasty sales immediately after the harvest

which lower and disturb the course of prices, to the detriment of the producer and without benefit to the consumer. By facilitating the substitution of other crops for wheat, and systematic and orderly marketing by individual farmers as well as by co-operative societies, short term agricultural credit can contribute to a rationalization of production, to a greater stabilization of prices, and to a better organization of exports and of markets.

In this regard, the Conference is of opinion that the transfer of capital may advantageously take place between countries where it is plentiful and cheap and those where it is scarce and costly, and that it is necessary to study the means of facilitating such transfer of capital on an international scale in order to develop short term agricultural credit in all countries.

(4) The Conference again expresses the opinion that it is desirable to provide exporters with the credit necessary for speeding up the clearance of stocks and that in particular transport agencies, bonded and general warehouses and shipping companies might with advantage intervene here by utilizing the credit which such bodies have already at command.

Thus as proposed by the Committee established by the Commission for the study of the question of European Union, it might become possible to consider for the purpose of discounting bills a fuller utilization of those markets on which the rate of interest is low, the issue of warrants on merchantable products, and the possible introduction of the system of a negotiable way-bill.

(5) The Conference requests the International Institute of Agriculture to continue its studies relating to agricultural credit, and to endeavour to draw up a general scheme for the organization of short term agricultural credit.

III.—PREFERENTIAL TARIFF SYSTEM

The Conference has noted that the discussion on the preferential tariff system, which took place in the Commission appointed to consider this question, was based on an appendix to the report of a Commission of the Second Conference in favour of a concerted economic policy, which met at Geneva in November, 1930. The discussion has been carried as far as is at present possible in the field of multilateral conversations.

The principal difficulty encountered by the Commission lay in the fact that the Delegates of several important wheat exporting countries declared that they did not possess the materials necessary to enable them to estimate the possible loss which they might suffer as a result of the preferential system, nor the possible advantages that they might be able to derive therefrom.

Hence, if the interested countries, who are prepared to make trade agreements on a preferential basis, desire to continue the discussion, it will be necessary for them to have recourse to diplomatic channels.

The Commission also ascertained that all exporting countries have the same interest, in so far as they all desire to see the European market strengthened, so that they may obtain remunerative prices for their cereals.

The above resolutions were approved unanimously by the Conference except that the Russian Delegation reserved its approval in the case of Resolutions 1 and 7 of Part I and voted against Parts II and III.

Probably the most important result of the Conference was the decision taken by the representatives of exporting

countries, both European and overseas, to meet in London last month under the chairmanship of the High Commissioner for Canada, to attempt to formulate an agreed plan for the liquidation of existing stocks and of any surpluses from the crops to be harvested in 1931-32. It will also be noted that there was general agreement as to the impossibility of achieving compulsory restriction of area, and as to the need of propaganda for increasing consumption, although in regard to the latter question the representatives of Germany, France and Italy stated that for reasons of internal policy their countries could modify neither their tariffs, nor their requirements as to the minimum proportion of native wheat milled. No resolution was passed concerning the proposal of the exporting countries of Eastern and Central Europe that their wheat should be granted preference by European importing countries, it being agreed that this proposal must be dealt with through diplomatic channels.

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STACK BUILDING AND THATCHING

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THE object of stack building being to store the material and keep it in good condition until required for feed, or until threshing, it is important to choose a suitable site on dry ground, to exclude moisture from the foundation or steddle of the stack, and by building stacks in the open, to expose them to the influence of wind and sun. Permanent steddles, known as " Brandreths "—platforms of wood, iron, stone, or brick—are fitted on some farms. The stacks are thus raised about 2 ft. 6 in. from the ground, giving free circulation of air to condition the material. They are very useful for grain crops; it is said that corn conditions better on them than if built on the ground. If these permanent steddles are not available, a suitable foundation of wood, faggots, or hedge trimmings, covered with a liberal layer of dry straw, makes an efficient steddle for either hay or corn stacks.

There are numerous types and shapes built, according to the custom of the district; oblong with square corners and gable roof; oblong, with round ends, known as cullis ended; oval, built with a barrel-shaped roof; round stacks with a conical roof; and hip roof stacks. The three latter types require thatching round the whole of the roof, as it is drawn in all round; this is an advantage, less material being required for the roof. Having decided on the shape and site, and a steddle

To face page 204.

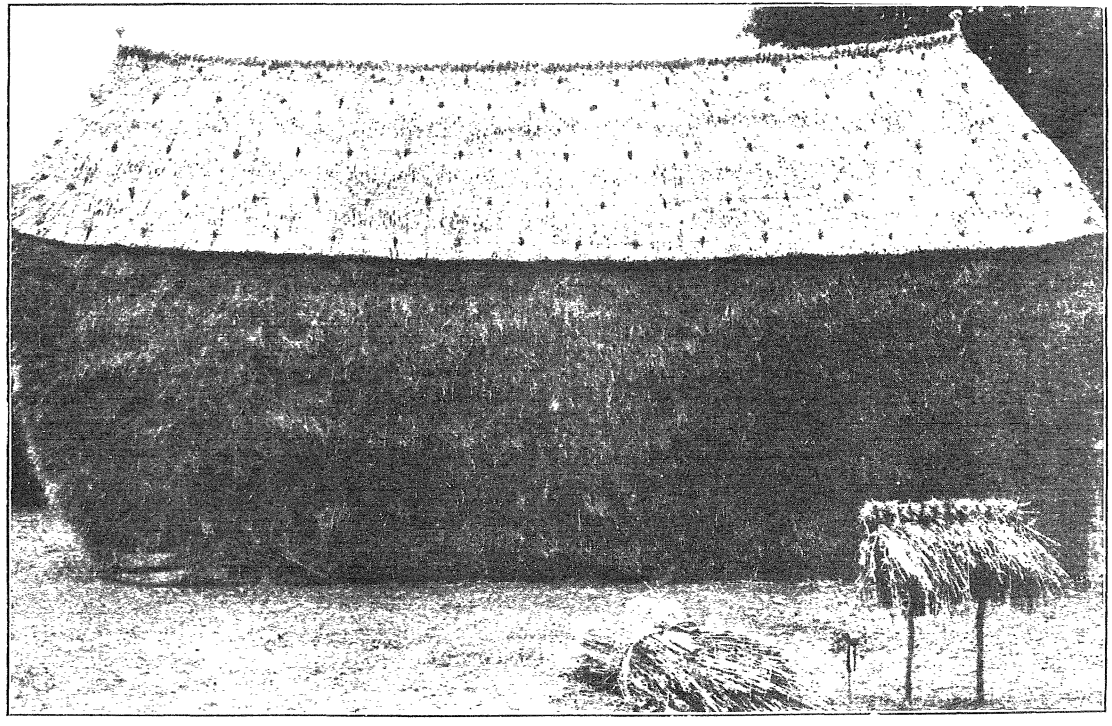


FIG. 1.—A hip roof stack: side view.

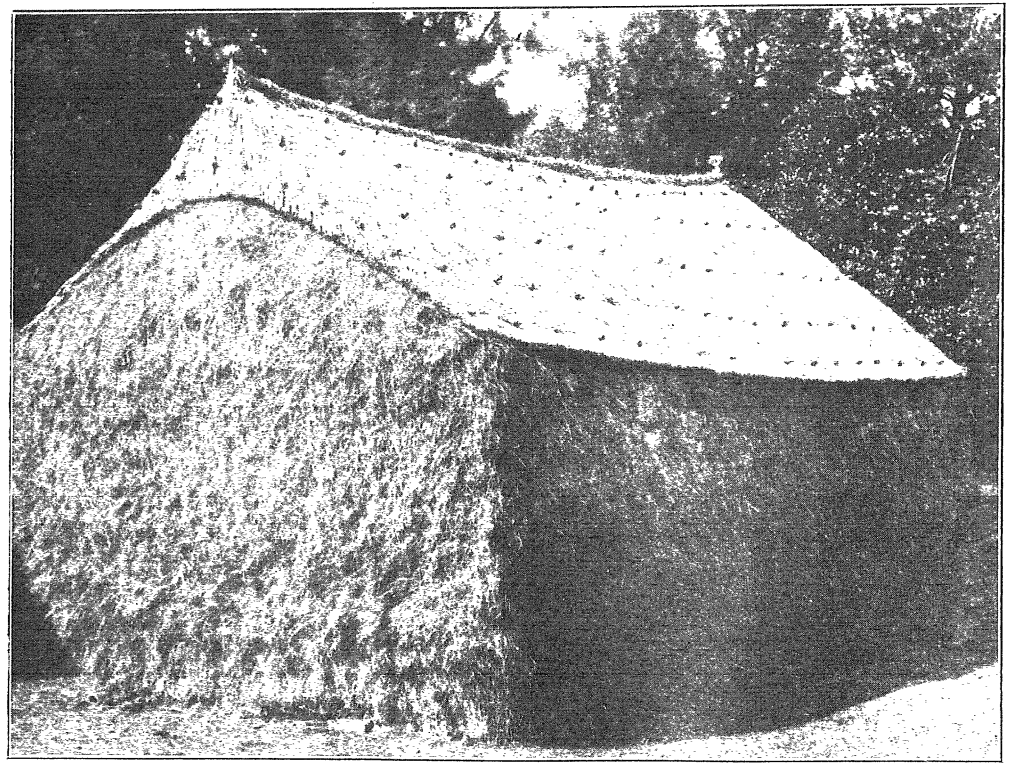


FIG. 2.—A hip-roof stack: end view.

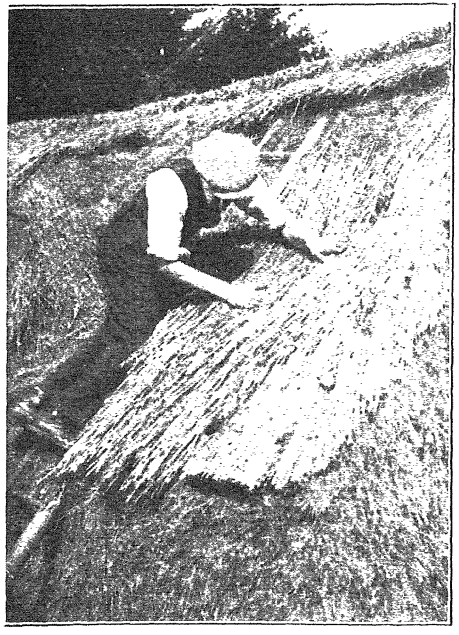


FIG. 3.—Placing yelms.

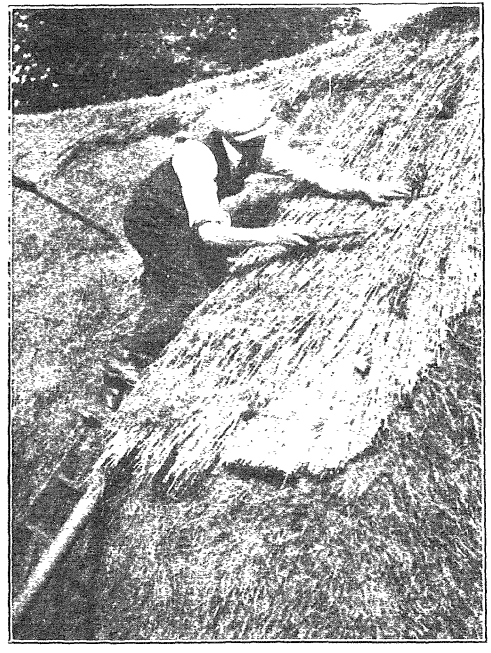


FIG. 4.—Combing yelms.



FIG. 5.—Banding and pegging.

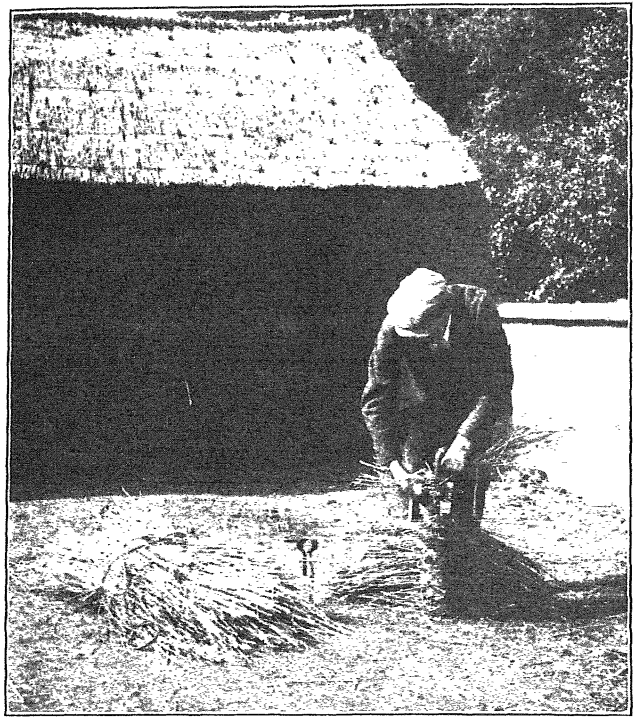


FIG. 6.—Making ridge-welt.



FIG. 7.—The ridge-welt.

having been prepared of suitable size to hold the material, the actual stacking can be commenced.

A steddle, approximately 4 yards wide by 10 yards long, should hold about 40 quarters of corn in an average crop of well-tied straight sheaves. Bulky, untidy sheaves romp up, and require more space. Mistakes are often made when crops are light by making steddles too large, when there may be difficulty in making a good roof. Well built, narrow stacks are much better than wide ones that require a large roof.

Corn Stacks.—When stacking sheaves on an oblong stack, it is advisable to commence by making a "stook" or "shock" along the centre of the steddle, with the exception of about a yard at each end. The next layer of sheaves should be placed with the ears level with the bands of those in the stook. This should be repeated until the outside of the steddle is reached. By this gradual increase of pitch, the outside layer is reached, without the ears getting in contact with the straw on the steddle, the butt of the sheaf serving as another layer to prevent moisture getting at the corn. When commencing a round stack a circular "stook" should be made, and the procedure will then be similar to that already described. In building oblong stacks, the outer course should be started at the centre of the side, and well-bound with the butt of the binding sheaf placed near the band of the outer course sheaves. The course being completed, and bound, the middle of the stack should be filled in. It is usual to start another outer course at the centre of the opposite side and work it in a reverse direction, this giving a tighter and more efficient binding.

Stackers use different methods. Some work with a fork, others stack with the hands. Some stack and bind a course one sheaf deep, others lay a course several sheaves deep. Either way serves if the courses are well bound and the middle is well filled. Some stackers walk forwards and tread on the sheaves just placed, others walk backwards and stack as they move back. It must be remembered that the centre of the stack carries the heaviest weight, and must be well filled, so that it cannot settle below the outer course and draw with it the heads of the outer sheaves, so allowing wet to enter the sides of the stack.

Usually a helper is taught to bind, or at least fill in the centre. His work is almost as important as the actual stack building. When laying the outer course, it is important to remove any loose material from the sides, as this will tend to

make the sheaves slip. It is an advantage to empty loads on alternate sides while building, this giving even pressure, and helping to steady the stack. A well built and well bound stack, erected upon even ground, should stand erect and settle evenly. In the case of stacking slippery material, or where loads can only be emptied on one side, props may be used to steady it while settling. These should not be too long ; short, stout ones will be more effective, if placed well under the overhanging portion, causing the stack to settle over from them. It is well to note the result and loosen them when their duty is done.

Roofing.—This is a very important part of the work. The fact that the roof is the portion on which the rain falls calls for great care in building. After the walls are finished, a short, stubby, false roof should be built, commencing with a first layer on the binders of the last wall course, carried up, and rounded off in the centre of the stack. The roof proper will then be built upon this, starting on the last outside course of the walls. The roofing sheaves will all lay with butts downwards, care being taken that no ears are showing. When the roof is nearly complete and too narrow to place more sheaves crosswise, sheaves should be placed lengthways, butts towards the ends of the stack, again allowing no ears to show. In some cases the stack roof is topped up with loose material, rakings, or straw, when too narrow to place sheaves crosswise, the straw being held in position by the use of thatch pegs until the stack is thatched.

When erecting high stacks it is necessary to use some kind of a stage in order to reach the top. A platform can be made by driving two long stakes into the side of the stack, on which a platform of boards may be fitted. If a " steer " or " pitch hole " is made in the roof it is important to fill it in carefully to prevent damage by rain. The roof should be well beaten downwards, and all loose straws containing exposed ears of corn should be removed.

Stacking Loose Material.—Loose material is usually stacked in a similar manner to corn. A steddle, 5 yards by 12 yards, will hold about 10 acres of a heavy hay crop. When stacking, the middle should be kept well filled, the hay well distributed, and lumps shaken out. If small portions of green material are put up, they should be placed near the sides to allow it to condition. It is important to keep the middle high when roofing. When the stack is completed, the roof should be combed down to allow any rainfall to get away. After the stack has settled down, it is a good policy to roof again to ensure a solid, firm roof to thatch.

Thatching cannot be done until the roof has settled, and the heat abated. If sheets or cloths are used during a wet spell, they should be suspended upon poles fitted on trestles, or ladders, at each end of the stack, to allow the heat of the material to escape at the ends of the sheet. If sheets are used on corn stacks, it is advisable to place a layer of straw before sheeting down, as this will prevent wet from steeping through to the corn. If stacks are rounded up in the centre and sheeted down during wet weather, the centre should be levelled again, or roughed up in the case of hay, before more material is put into the stack, or it might result in the whole stack slipping, especially if it has been clothed down on a few loads near the base, and stacking is re-started without taking this necessary precaution.

Thatching.—It is usual to find the best thatching in districts where there is a shortage of straw, and the rougher work where straw is plentiful. Yet well-built stacks, neatly thatched, certainly repay both the farmer and the workman, because they are more pleasing to the eye, and there is an assurance that the crop is perfectly safe from the elements. Inferior thatching is a waste of time, money, and labour, and one cannot expect the material to turn out in good condition. In some instances, stacks are roughly covered during slack, dull harvest weather, those that are to stand for a prolonged period being afterwards re-thatched.

There are many different styles of thatching, which vary according to the district and, as the object is the same in all cases, it is unnecessary to explain every style. Wheat and rye are the best and most widely-used thatching straws. If neither wheat not rye straw is obtainable, oat and barley straw can be used, but it is more difficult to work into shape and will not wear so well. Where there is a shortage of straw, reeds and rushes are harvested and used for the work. Reeds and rushes will be found very durable, and if the work is done efficiently, will last for a number of years. Revitt's wheat makes exceptionally good material for thatching.

Tools Required.—Tools used for thatching consist of a small comb or rake, a pair of strong bow shears, a ladder of sufficient length to reach the ridge of the stack, a pair of knee caps, twine—either cocoanut twine, tarred twine, or binder twine—a thatcher's knave, platform for holding the thatch on the roof, thatch pegs, splits or spars, ropes or pegs for carrying the bundle of thatch, a hay-fork, and a billhook for pointing pegs.

Two men, or a man and a youth, are employed for the work, one as server, the other for the actual thatching. The duty of the former is to prepare the thatch, wind twine reels, sharpen pegs, carry up the thatch, and generally assist. His work is just as important as the thatcher's, because the quality and speed of the work depend to a large extent on how he carries out his duties. He also has a splendid opportunity to learn the actual thatching when working under a skilled man. He can try the work when stacks are being "roughed," on stacks of rakings, or on straw stacks where there is less risk of damage. The thatcher takes the responsibility of laying the thatch, combing, banding, and pegging down in an efficient manner, on a well-levelled solid roof, that will resist all kinds of weather.

The levelling of the roof is very important; stacks that appear to stand well when completed often settle with a badly pitted, uneven roof. This must be levelled before thatching, by combing off lumps, and packing up the hollows. It is useless to expect thatch to turn rain on an uneven roof. A batten of straw can be placed along the ridge and the eaves can be squared to assist in shooting the water from the stack sides.

Preparation of Straw.—This depends upon the class of material used. In some cases, it is made up from the loose straw stack and sometimes it is tied in battens or sheaves by the thresher. The best way of preparing the former material is to draw out the long straws, comb out loose flag and short material, tie up and store until required for thatching. This work can be done in winter, if desired, the loose, short material being used as litter. Another method with this class of material is to throw down a pile of straw, level, damp, and beat it with a fork. This is repeated until sufficient is prepared for a few days' work. The pile is usually weighted down with wood or a set of iron harrows, and the thatch is drawn out from round the outside at the base of the pile. With this method it is usual for both men to prepare the "thatch bed." The server then prepares the "welts" or "yelms" by drawing out from the pile with both hands, giving a sharp swing to straighten out the straw. The straw is placed at the server's feet until sufficient is drawn to make a welt or yelm about 2 ft. wide and 3 in. thick. The yelm is combed free of short trash, firmly packed, and placed upon the carrying rope, chain, or pegs, whichever it is intended to use. Several of these yelms are placed slightly crosswise to ensure their remaining separate. The number depends on the length of the stack roof and the width of the "course" or "stetch"—the width the thatcher can reach.

Yelms prepared from bundles tied and combed in readiness only require damping and straightening out. Those tied by the thresher usually require a fair bit of combing to remove short straw and flag before damping and making into yelms. All material is best wetted a day or so before using. The straw is rendered softer, more pliable, will bed down to the roof, turn rain better, and improve the appearance of the work considerably. When placing the prepared yelms in the bundle, it will be noticed that one end is thicker than the other. The thick end is the portion that was grasped by the hands when drawing from the pile. In the case of using straw tied by the thresher the heads are all facing in one direction and the butts the other. Naturally the butts are the thickest in this case. However, by either method the thick ends of the yelms should all be placed in the same direction. This will help the thatcher considerably, as he will know at once which way to lay the thatch on the roof.

A number of pegs are placed on the bundle and the whole is tied firmly through a running noose, bone, or ring attached to the rope, and carried up to the thatcher.

Laying the Thatch.—The position taken up by the thatcher at the start depends upon the shape of the stack ; cullis-ended stacks are usually started halfway along the side of the roof, gable-ended stacks at the end of the side, and hip-roof stacks at the centre of the end. The ladder should be placed to lay flat on the stack roof, and perfectly straight up the stack, a distance of about three feet from where it is intended to start. A right-handed thatcher lays the thatch on the right of the ladder, and has his bundle of yelms and pegs placed upon the knave or other method of support on the left of the ladder. Forks are sometimes used for the support of the bundle.

Having prepared and levelled the roof, and built a sharp ridge, the eaves are then bolstered-up. This is done on corn stacks by the use of small battens of straw where necessary and, in the case of hay stacks, by the use of material drawn from just below the eaves, folded, and pushed in at the eave, which has the effect of lifting the eave, shortening the roof and lengthening the wall, and giving a sharp setting to throw the water from the stack sides. The thatch is then placed in position on the right of the ladder by starting to lay the first yelm at the eave with the thick end or butt end downwards. The upper portion or thin end is tucked into the stack roof, and the whole is beaten down firmly, holding in position with the left hand while this is done to prevent it sliding from the roof. The second

yelm is placed to overlap about half the first one. This is beaten solid, and a third yelm is placed in a similar manner. It is not necessary to overlay the upper yelms more than about one-third of their length, as they have less water to carry away. Thatch drawn from loose straw is usually placed with the thin end of the yelm downwards, with the exception of the yelm placed near the eave. Straw that is tied from the thresher can be laid with all butts downwards if desired, as the ears lay all in one direction, and the butts are stronger and more durable when placed to the weather.

The whole of the course being covered with well-laid thatch, beaten down solid, is then combed down, a process that will take out short trash and straighten out any straws that are crosswise. The beginner will notice that there is a tendency to draw the thatch towards the ladder when combing or banding; this should be avoided, as it will spoil the appearance of the work. The combing and banding is done by commencing at the ridge. It is not advisable to comb down the whole course before banding. This should be done as each yelm is combed, and the bands should be so arranged that each yelm is held in position by two bands—one within 4 in. of the top and the second about the same distance from the lower end. The number of bands used on the stack is governed by the number of yelms placed on the roof. The number of yelms used depends upon the length of the straw and the length of roof.

Position of Pegs or Splits.—These should be placed in such a manner that they will not be directly under, or in a vertical line with each other, or a hollow will be formed that allows water to collect and eventually enter the stack roof. They should be placed so that any four pegs will form the shape of a diamond. This is achieved by the following method. If two pegs are placed on each band on a course, the nearest peg on the top band is placed about 2 in. from the ladder, and the further peg half-way between it and the gable end or the nearer peg on the last course completed. On the second band the nearer peg is placed about 15 in. from the ladder, or half-way between the pegs on the upper band. On the third band the pegs correspond with those on the first band, and the fourth row ones correspond with the pegs in the second row. By this method they are placed so that no vertical hollows are formed and the work is given a very neat, even appearance. They should be pushed horizontally into the roof to prevent rain entering at the peg holes. If a narrow course is taken by a beginner, or by one with a short reach, one peg may

be found sufficient to fasten each yelm. Some thatchers prefer to use double the amount of pegs in the ridge and eave bands, and fewer in the centre bands. One may find that the bands have a tendency to rise slightly as the work proceeds. This is caused by pushing home the pegs after the bands are fastened on them. It can be prevented by placing the pegs below the band when the latter is stretched across the course at level. Then, as the pegs are forced into the roof, the bands will lift into their correct position. Various knots are used to hold the bands, a half-hitch on each peg, a simple turn and a half-hitch on alternate pegs, and an overlapping twist on each peg across the whole of the roof. The latter is very effective, being quickly removed when threshing day arrives.

Cutting Eaves and Ridge.—This may be done as each "stetch" or " course " is completed, but some thatchers prefer to cut them when the whole side is completed. The eave may be cut with a sharp paring knife, and finished with a pair of shears, care being taken to cut square with the thatch so that the upper edge of the eave yelm is not shorter than the under edge. The ridge may be cut as each side is completed or when both sides are finished. Either method is suitable, provided each side is closely fitted to bring the thatch to a good ridge. A ridge yelm or twisted double yelm is sometimes placed as shown in the illustration. This gives a well-finished appearance, is easy to make, and ensures a water-tight ridge at the top of the thatch. It is made in a similar manner to the twist band used for tying straw battens or sheaves. Two handfuls of straw are placed together and twisted about three turns. Three pegs having been placed in the ground about 9 in. apart in the shape of a triangle, the straw is allowed to curl itself into a loop, which is placed over the centre peg as shown in the illustration. The outside pegs hold the ends of the straw in position. When the centre peg is covered with straw bands, the sides are combed out, and the portion which forms the ridge is trimmed with shears. These yelms are placed along the whole of the ridge, and banded down with the upper band on the side first thatched. It is necessary to lift slightly to tuck under the upper yelm when the opposite side is being done. The whole is banded down and makes a firm weather-proof ridge.

The chief items of importance in efficient thatching are good straw that is well drawn and prepared, carefully placed, with no joinings showing, thoroughly beaten down, banded with pegs well placed, and neatly combed and trimmed.

THE PREVENTION OF FINGER-AND-TOE (CLUB-ROOT) IN GARDENS AND ALLOTMENTS

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FINGER-AND-TOE or Club-Root disease, caused by the Slime Mould, *Plasmodiophora Brassicae* Wor., is one of the most troublesome and destructive diseases with which the vegetable grower has to contend. With the exception of those favoured districts where lack of lime in the soil is practically unknown, more especially in the Eastern Counties, Finger-and-Toe occurs in almost all places where plants of the cabbage tribe (Brassicas) are cultivated.

To the majority of growers, the disease is only too familiar. It can attack almost any cruciferous plant, and is characterized by the formation of irregular swellings upon the affected roots. In severe cases, these swellings increase to such an extent that the root entirely loses its fibrous character and becomes converted into a large club-like mass. As a result of these abnormal growths, the action of the root is checked, or may be entirely upset, so that the plant remains permanently stunted or dies prematurely. Under specially favourable conditions, attacked plants may form new roots above the diseased portion and so continue their growth, but they rarely fully overcome the severe check received.

An important practical feature of the disease is that its germs or spores can remain dormant in the soil over long periods and, once introduced, are exceedingly difficult to eradicate.

From the fact that Finger-and-Toe develops most rapidly under acid conditions, *i.e.*, in sour soils, the application of lime is generally and rightly advocated as the most practicable means of control, and such applications usually serve to check the disease to a considerable extent.* On comparatively small areas, however, where it is inconvenient or even impossible to arrange for a proper rotation of cropping, the action of lime is too slow to enable full benefit to be derived from it, so that some more rapid and effective means of controlling the disease becomes a necessity.

In view of this, and with the problems of the small grower especially in mind, experiments have been conducted since

* For further particulars concerning the disease and its control by liming see Leaflet No. 77, obtainable from the Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

1924 at the Harper Adams Agricultural College with a number of substances considered likely to prove effective in controlling the disease.* One chemical, mercuric chloride (corrosive sublimate), having given consistently good results over the first four years, was further tested during 1928-1929. The experiments, together with trials of certain other substances, are here described.

General Lay-Out of Plots.—With the exception of a single trial with swedes, the experiments at the College were carried out on a strip of land, some 200 yards long by 6 yards wide, which had been used for similar work for three years previously and was known to be evenly and heavily infected with the parasite. The cultivation was that of the remainder of the field, but the only manure given was a medium dressing of farmyard manure.

The strip was divided up into lengths of fifteen yards each, separated by paths two feet wide, each plot thus formed being the full breadth of the strip except for a narrow path left along one side. Healthy plants of Ellam's Early cabbage were set in eight rows, 2 ft. wide, down the strip and, with 18 in. between the plants, each plot contained some 120 plants.

One or more complete plots were allocated to each treatment, except in a few special instances where only portions of a plot were used. The actual number of plants set on each particular plot is stated in the tables.

Where individual treatment was given, as with mercury compounds, the treated and untreated plants occupied alternate rows on the same plots. Where calcium cyanamide and nitro-chalk were used, however, the units consisted of two complete treated plots with an intervening control plot.

Duplicate trials (on similar lines) were carried out in certain Staffordshire school gardens. In some of these, savoys were used instead of cabbages.

Experiments with Mercury Compounds.—I. *Mercuric Chloride* (Corrosive Sublimate).—In the experiments before 1928, this chemical had been used only as a 1 in 1,000 solution. It was found, however, that at this strength a severe check to growth sometimes occurred. Weaker solutions and other methods of using this chemical were therefore tried, tests being made as follows :—

(1) Mercuric chloride solutions 1 : 1,000, 1 : 1,500, and 1 : 2,000, applied directly to the planting holes, ½ pint per hole. Controls

* N. C. Preston, " Experiments on the Control of Finger-and-Toe in Cabbages " : *Welsh Jour. of Agric.*, Vol. IV, 1928, p. 280.

received ½ pint of plain water. This will be called the "watering in" method.

(2) Roots of plants dipped for 5 to 15 minutes before setting in mercuric chloride solutions, 1 : 1,000 or 1 : 2,000; no soil treatment. At the Staffordshire centres the solution was first mixed with soil to a creamy consistency before dipping; at the College the simple solution was used.

(3) Mercuric chloride applied dry. One oz. of the finely powdered chemical was intimately mixed with 31 oz. of precipitated chalk, and ½ oz. (a dessert spoonful) or ¼ oz. of this mixture was put into each hole before planting. The amounts of pure mercuric chloride thus given were approximately equal to those contained in ½ pint of a 1 : 1,000 and a 1 : 2,000 solution, respectively. Control plants received equivalent amounts of chalk only. The effect of this dry treatment was to cause most of the plants to wilt and die in a few days; the chalked control plants were unaffected. The damaged plants were, however, replaced by fresh ones, set in exactly the same places as the original seedlings, without further treatment; and the figures in Table I refer to these latter plants, and thus indicate the "residual effect" of the mercuric chloride.

II. *Mercurous Chloride* (Calomel).—This substance had already been tried on a small scale and was found sufficiently promising to warrant further investigation. The moist roots of the seedlings were dipped into the dry, powdered chemical.

Table I gives the results of the trial with these mercury compounds. The figures are averages from each series of plots in 1928 and 1929, and they will be discussed in a later paragraph.

Experiments with Calcium Cyanamide.—Hötter, in Austria, has reported experiments in which an apparently successful control of Finger-and-Toe was obtained by soil treatment with calcium cyanamide, whilst Kindshoven* recommends the use of this substance at the rate of ¼ kilo per cubic metre of soil, as an alternative to lime, for preventing this disease. Calcium cyanamide, moreover, has been said to be a preventive of Finger-and-Toe in parts of England, and it was therefore important to test it.

The calcium cyanamide used as a fertilizer in this country is the "oiled" product, more easily handled than the unoiled material. According to Hötter, however, the addition of oil reduces the fungicidal efficiency of the cyanamide, and both "oiled" and unoiled material were used in the present trials.

1928 *Experiments.*—Of six plots, two received (by broadcasting) ½ lb. per sq. yd. of unoiled calcium cyanamide (Hötter's effective dressing), while two others were similarly dressed with the "oiled" product. Between the two pairs of treated plots, one of the same area was left untreated as a control.

The plots were planted with cabbages one month after

* See *Review of Applied Mycology*, 7, 1928, p. 691.

TABLE I

EFFECT OF MERCURY CHLORIDES UPON THE CROPPING AND ROOT DEVELOPMENT OF CABBAGES AND SAVOYS IN SOIL INFECTED WITH FINGER-AND-TOE

Treatment	Plants cut	Average weight per head lb.	Condition of Roots		
			Clubbing, absent or slight %	Clubbing, bad or moderate %	Indeterminate, "fly," etc. %
Mercuric chloride 1 : 1,000, put in holes	90	3·3	67·0	31·0	2·0
Controls. Water only	96	0·4	0·0	80·0	20·0
Mercuric chloride 1 : 1,500, put in holes	498	2·3	67·6	29·6	2·8
,, ,, 1 : 2,000, ,, ,, ...	283	1·9	68·4	19·2	12·4
Controls. Water only	800	0·6	5·8	81·2	13·0
Mercuric chloride 1 : 1,000, roots dipped	257	1·5	25·3	72·7	2·0
,, ,, 1 : 2,000, ,, ,, ...	51	0·5	22·0	71·5	6·5
Controls. Water only	308	0·8	13·2	77·6	9·2
Mercuric chloride, dry, with chalk .. .. .. (= "residual effect," see p. 274)	203	2·7	55·5	40·5	4·0
Controls. Chalk only	187	0·7	0·5	79·5	20·0
Mercurous chloride, dry	173	—	59·0	37·3	3·7
Controls	159	—	3·0	79·7	17·3

treatment. The adjacent margins of treated and control plots were sown with cabbage seed at the same time, the usual pathway being thus replaced by a seed-bed about 18 in. wide.

1929 *Experiments.*—The *unoiled* calcium cyanamide gave no encouraging results in 1928 and the *oiled* product only was tested in 1929. Three plots were used, two of them (plots 1 and 3) receiving cyanamide at the rate of 1 cwt. per acre. An equivalent nitrogenous dressing of sulphate of ammonia was given to the intervening plot 2, which served as a control.

A trial with swedes was also carried out on another part of the field, on which an ordinary farm crop of swedes was being grown. This trial consisted of a long strip containing some 20 rows of plants, and divided into plots, each 1 chain in length. These plots received sulphate of ammonia and calcium cyanamide respectively, at the rate of 1 cwt. per acre. The seed was sown, along with the main swede crop, a fortnight after the distribution of the two fertilizers. Counts of diseased and healthy roots were made in the following November from the central 12 rows only, and counting was begun, and discontinued, 3 yards from the end of each plot.

Unfortunately, though present to some extent, Finger-and-Toe was not at all severe over this experimental strip, the clubbing being such as could easily be removed by "tailing." The roots, however, were examined immediately after being pulled, and such as showed any trace of clubbing on rapid examination were classed as "clubbed," while any in which the disease could not readily be detected were classified as "clean."

The figures obtained from the two years' experiments with calcium cyanamide are included in Tables II and III, which, however, contain no figures from the three 1928 "oiled" cyanamide plots, since on these the plants were so severely attacked by the cabbage root maggot that no reliable data could be obtained.

Experiments with Nitro-Chalk.—Reports alleging satisfactory control of Finger-and-Toe disease in Staffordshire by applying nitro-chalk at planting time, having been made in 1928, it was thought desirable to try this substance in 1929. This was done at the College in a manner similar to that adopted for the calcium cyanamide trials. Dressings of 1 and 2 cwt. per acre were applied broadcast and well raked in on the day previous to planting. The intervening control plots received equivalent dressings of sulphate of ammonia.

TABLE II

EFFECT OF CALCIUM CYANAMIDE AND OF NITRO-CHALK APPLIED AT VARYING RATES UPON THE INCIDENCE OF FINGER-AND-TOE DISEASE IN CABBAGES

Treatment	Plants cut	Average weight per head lb.	Condition of Roots		
			Clubbing, absent or slight %	Clubbing, bad or moderate %	Indeterminate, "fly," etc. %
Calcium cyanamide. Unoiled (½ lb. per sq. yd. = 21 cwt. per acre)	203	2·1	18·0	61·5	20·5
Calcium cyanamide. Oiled. (1 cwt. per acre)	185	1·6	17·5	75·0	7·5
Controls	187	0·9	9·5	71·5	19·0
Nitro-Chalk. 1 cwt. per acre	181	1·3	16·5	75·0	8·5
„ 2 „ „	310	1·1	8·7	83·0	8·3
„ 5½ „ „	121	3·7	47·0	53·0	0·0
Controls	462	1·4	16·0	81·6	2·4

TABLE III

EFFECT OF CALCIUM CYANAMIDE ON INCIDENCE OF FINGER-AND-TOE IN SWEDES

Sulphate of Ammonia				Calcium Cyanamide			
Plot	No. of clubbed roots	No. of clean roots	Per cent. clubbed roots	Plot	No. of clubbed roots	No. of clean roots	Per cent. clubbed roots
1	246	198	55	2	350	267	57
3	451	150	75	4	231	388	37
5	244	337	42	6	195	385	34
7	134	566	19	8	39	591	6
9	78	564	12	10	67	473	12
11	68	427	14	12	21	522	4
Total 6 plots	1,221	2,242	35	Total 6 plots	903	2,626	26

In 90 per cent. of the roots classed as "clubbed" the diseased portions could easily have been removed by "tailing."

A similar trial was also carried out at one other centre, but here the amount of nitro-chalk applied was increased to 5½ cwt. per acre, control plots with an equivalent dressing of sulphate of ammonia being again included. The results are included in Table II.

Seed-Bed Treatment.—The experiments with cabbages so far described were designed to secure means by which *originally healthy* young plants might be protected from Finger-and-Toe when transplanted into infected land.

In many districts, however, the raising of healthy young plants is very difficult, because the soil is so thoroughly infected with the Finger-and-Toe organism. In such districts, this difficulty must be overcome if soil treatment at the time of transplanting is to be successful. Certain methods of seed-bed treatment were therefore tried in 1929 upon a plot of very heavily infected land in Staffordshire.

The plot was divided into ten smaller plots, separated from each other by channels 3 in. in depth, the lay-out being :—

—1— —2— —3— —4— —5—
—6— —7— —8— —9— —10—

Plots 1 and 9 were treated with a 2 per cent. formalin solution.
Plots 3 and 10 were treated with a 0·1 per cent. solution of mercuric chloride.
Plots 5 and 7 were treated with a 10 per cent. solution of a tar oil wash.
Plots 2, 4, 6, 8 were left untreated as controls.

All the solutions were applied in April, at the rate of 2 gal. per sq. yd., the seed being sown one month after treatment.

Over one hundred plants from each plot were examined early in the following November, and the figures obtained indicated clearly the value of such seed-bed disinfection by either mercuric chloride or by formalin. Where either of these solutions was applied, a reduction of some 40 to 50 per cent. in the proportion of badly diseased plants was noted, while the proportion of perfectly clean roots was increased to a similar extent. This latter fact is of particular importance seeing that only plants with absolutely clean roots would be selected for transplanting, and the success of the treatment must be judged primarily upon the proportion of these present.

The trial with a tar-distillate wash was vitiated owing to the failure of the seeds to germinate or to the death of the plants in the cotyledon stage. This persistence of the disinfectant for some two months after its application to the soil

is to be attributed to the extremely dry weather experienced at the time.

Discussion of Results.—*Mercury Compounds.*—The effect of the mercury compounds employed, as regards increase in weight of crop and diminution of disease, is summarized in Table IV. The figures there given represent, under each heading, the maximum and minimum differences between the percentage values recorded from treated and control plants respectively; they also indicate the range of variation in the results obtained over the whole series of plots.

From a consideration of this Table it will be seen that mercuric chloride gave good results at each strength, and that the weakest solution was as good as the stronger ones. The weaker solutions, moreover, did not check growth at all. A mean decrease of serious clubbing of 56 per cent. was obtained over the two years, the number of clean or only slightly clubbed roots was likewise increased by a mean of 62 per cent., while the crop obtained showed a mean increase of 1½ lb. per head over that of the untreated plants.

While the general improvement following the mercuric chloride treatment is obvious, certain points in Table IV nevertheless require some consideration. There is a very wide fluctuation in the weight of crop obtained, varying from an increase of 3 lb. per head to an actual decrease, in one instance, of 0·3 lb. It will be seen at once, however, that the difference in yield was generally higher for the 1928 experiments than for those of 1929, this leading to the conclusion that the main factor involved here is a seasonal one. The average weight of a good Ellam's Early cabbage, under the experimental conditions of manuring, but on clean soil, may be reckoned as about 2½-3 lb. Further, it is to be noted that the plants of 1929 were generally of a poorer quality than those of 1928, while the wet weather in the autumn of 1929 doubtless enabled the controls to "heart up" better finally than was possible under the drier conditions of the previous year.

Secondly, it is noteworthy that there was a somewhat wide variation between the maximum and minimum figures for the percentage of badly or only slightly clubbed roots. This may largely be attributed to purely local conditions, and it is still evident that even the minimum figures show a significant difference between treated and control plants. In no single instance was a negative difference obtained, the reduction of

TABLE IV

DIFFERENCE FIGURES : SHOWING EFFECT OF TREATMENT WITH MERCURIC AND MERCUROUS CHLORIDES

Treatment	Year	Increase in average weight per head lb.			Clubbing, absent or slight Per cent. increase			Clubbing, bad or moderate Per cent. decrease		
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
Mercuric Chloride 1 : 1,000 " watered in " ..	1928	2·9	2·9	2·90	67	67	67·00	49	49	49·00
" 1 : 1,500 " ..	1928	3·0	2·8	2·90	62	46	54·00	45	43	44·00
" 1 : 1,500 " ..	1929	1·0	—0·3	0·43	81	43	60·33	76	43	58·67
" 1 : 2,000 " ..	1928	2·9	2·6	2·75	64	47	55·50	41	32	36·50
" 1 : 2,000 " ..	1929	1·6	0·1	0·63	82	62	72·00	80	73	77·33
Whole Series	1928 / 1929	3·0	—0·3	1·58	82	43	62·09	80	32	56·18
Mercuric Chloride 1 : 1,000 " dipped " ..	1929	1·0	0	0·33	20	—3	8·00	20	—5	7·33
" 1 : 2,000 " ..	1929	0·2	0	0·10	33	—3	15·00	26	—21	2·50
Whole Series	1929	1·0	0	0·24	33	—3	10·80	26	—21	5·40
Mercurous Chloride. Dry	1928	1·8	1·8	1·80	54	54	54·00	26	26	26·00
	1929	—	—	—	66	48	57·00	63	38	50·50
Whole Series	1928 / 1929	—	—	—	66	48	56·00	63	26	42·33

clubbing never falling below a figure of 30 per cent. in favour of the treated plants.

Much less satisfactory results were obtained by the "dipping" method. The mean differences in this series, though positive, are too small to be really significant. The general unreliability of the treatment is also shown by the negative figures for reduction in the extent of clubbing. Owing to the simplicity and economy of the "dipping" method, however, it would appear to be worth a further trial. It undoubtedly affords some measure of protection and it seems possible that, under certain conditions, this mode of treatment might serve as an alternative, though an inferior one, to the "watering in" method.

The results obtained with dry mercurous chloride (Calomel) are certainly encouraging, and agree closely with others obtained from small plots in previous years. This substance gives a definite measure of control, and has the distinct advantage that it is very easily applied and is much less poisonous than the mercuric salt. Further experiments are therefore being made with it.

In connexion with the 1928 trials of dry mercuric chloride, even very minute quantities caused much scorching, but whether this would have been prevented, or minimized, by watering the plants after setting was not ascertained. The fact that a reasonable control of clubbing was obtained among the replanted individuals shows that these small quantities of the dry chemical caused effective local soil sterilization. Having regard, however, to the greater risk necessarily attending this method of using mercuric chloride, this investigation was not continued.

Seed-Bed Treatment.—The experiment described certainly indicates that adequate disinfection of the seed-bed can be obtained by using either mercuric chloride or formalin solutions. The production of clean seedlings is clearly of first importance, and the value of some such treatment of the seed-bed, where naturally clean soil is unobtainable, can scarcely be over-estimated.

Calcium Cyanamide and Nitro-Chalk.—The results with both these substances are disappointing, and, under the conditions of the experiment, neither of them can be said to have afforded any really practical measure of protection. Such differences as do appear between the treated and control plants, though fairly consistent, are generally too slight to be regarded as of practical significance.



A B A B A B

A plot of cabbage showing beneficial effect of mercuric chloride (1–1,500) watered-in at planting time. Rows marked A are untreated ; rows marked B are treated. The plot extends to the second white post on the left.

THE PREVENTION OF FINGER-AND-TOE (CLUB ROOT).

With regard to the beds of seedlings referred to on p. 274, counts made of 120 plants selected at random over the whole area of each bed gave the following percentages of *badly clubbed* roots :—

Bed 1	Control side	89 per cent.
	Calcium Cyanamide ..	41 ,, ,,
Bed 2	Control side	73 ,, ,,
	Calcium Cyanamide ..	51 ,, ,,

Average for Controls, 81 per cent badly clubbed.
Average for Calcium Cyanamide, 46 per cent. badly clubbed.

Here some fairly marked improvement is to be noted. Since, in this experiment, the control strips received no equivalent nitrogenous dressing, it may be contended that the apparent improvement is due to the nitrogen factor rather than to any fungicidal action on the part of the cyanamide. Against this view, however, must be placed the fact that where growth is particularly active it is usually found that the size and extent of the malformations on infected roots are proportionately increased.

A somewhat similar reduction of disease was found where nitro-chalk was applied at the rate of 5½ cwt. per acre. Even here, however, the percentage of badly-clubbed roots still remained too high for the measure of control to be considered adequate.

General Conclusions.—From the experiments here described, and from those of previous years, it seems reasonable to advocate the use of mercuric chloride (corrosive sublimate) solution as a preventive of Finger-and-Toe on allotments and market gardens where this disease is in any degree prevalent.

The treatment suggested as being most efficient is to "water in" the young plants with a solution of mercuric chloride, 1 oz. in 10 to 12 gallons of water, applying about half a pint of the solution to each hole before pressing down the plant. Such treatment of the plants, though not entirely eliminating the disease, will, under normal conditions, enable the grower to secure reasonably good crops even upon heavily infected soils. A single treatment appears to be all that is necessary under ordinary conditions, since, in previously reported experiments, successive applications during the growing season up to three in number gave no markedly superior results.

Where the seedling plants have to be raised in actually infected soil, preliminary treatment of the seed-bed is undoubtedly essential, and the use of 0·1 per cent. mercuric

chloride or of 2 per cent. formalin, at the rate of about 2 gal. per sq. yd. of bed, is recommended for this purpose. The solution should be applied three or four weeks before sowing if formalin is used, but with mercuric chloride so long an interval is unnecessary. Care should be taken when transplanting that only seedlings with perfectly clean roots are selected.

From the data obtained it appears that neither calcium cyanamide nor nitro-chalk can be relied upon to prevent Finger-and-Toe effectively.

Cost of Mercuric Chloride Treatment.—Mercuric chloride may be procured either in powder form or in tablets of known strength. The latter are generally prepared so that one tablet makes one pint, or sometimes one quart, of a 1 in 1,000 solution. They thus form a very convenient and ready means of making up the required mixture.

The cost of the chemical, when used as a 1 in 2,000 solution and applied by the "watering-in" method, allowing half a pint per plant, is about 3*d.* to 4*d.* per 100 plants treated. Where the "dipping" method is resorted to the cost would be reduced considerably, probably to about 1*d.* per 100 plants.

NOTE: The author's thanks are due to Dr. G. H. Pethybridge, Dr. Hannaford-Richards, and Mr. W. B. Thompson, and to the Staffordshire Educational Authorities and their school staffs, for very kind assistance afforded in connexion with these experiments.

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MARKETING NOTES

National Mark Eggs. Satisfactory progress continues to be made by the National Mark Egg Scheme. During the months of March and April, the throughput of the packing stations exceeded 30 million eggs per month, or over one million a day. The National Mark output in April was approximately 26 million eggs, as compared with nearly 18 million in April, 1930, an increase of 44 per cent. During the first four months of this year, the National Mark output has been 50 per cent. greater than during the same period last year.

The value of the National Mark Scheme to local authorities was recently confirmed by a representative of a County Council in the Home Counties, who stated that the introduction of statutory grades had considerably simplified the contract arrangements for the supply of eggs to institutions; it was now only necessary to stipulate the grades of National Mark eggs that were to be supplied. This was also true, in principle, of other National Mark commodities.

A further instance of the advantages of standardization is seen in the extended use of fibreboard containers to hold 15 dozen eggs, introduced by the National Mark scheme and now so popular in the egg trade. With the growing output of National Mark supplies, there has been a large increase in the demand for this type of container, resulting in the mass production of a standardized article and in a consequent substantial reduction in the price. Authorized packers have, in some instances, combined to make bulk purchases and, in this way, have secured even more advantageous terms.

For the use of auctioneers selling eggs under the grade designations, the Ministry has issued a supply of leaflets and posters advising sellers and buyers who attend the auctions of the obligations involved by the use of the statutory grade designations. Copies of the notices and leaflets may be obtained from the Markets Division, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

The Second Annual General Meeting of National Mark Egg Central, Ltd., was held in London on April 29. Mr. A. W. Street, Assistant Secretary of the Ministry of Agriculture and Fisheries, addressed the members on the year's progress, and Captain A. A. Plimpton (East Yorkshire Farmers, Ltd.), Chairman of the Board of Directors, reviewed the activities of the Society since its inception in February, 1930. The election of the directors nominated by the Area Committees

was confirmed by the general meeting, and it is anticipated that the ensuing year will see important developments in the Society's operations.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during April, 1930, and April, 1931, and the number of sides graded and marked for the five weeks ended May 23, 1931, were as follows :—

			Number of sides
LONDON			
Weekly average	April, 1930		2,074
,, ,,	,, 1931		2,077
Week ended	April 25, 1931		2,429
,, ,,	May 2, 1931		2,116
,, ,,	,, 9, 1931		1,953
,, ,,	,, 16, 1931		1,979
BIRKENHEAD*			
Weekly average	April, 1930		91
,, ,,	,, 1931		74
Week ended	April 25, 1931		69
,, ,,	May 2, 1931		57
,, ,,	,, 9, 1931		22
,, ,,	,, 16, 1931		33
SCOTLAND*			
Weekly average	April, 1930		2,464
,, ,,	,, 1931		2,553
Week ended	April 25, 1931		2,799
,, ,,	May 2, 1931		2,248
,, ,,	,, 9, 1931		2,012
,, ,,	,, 16, 1931		2,114
TOTAL LONDON SUPPLIES (All sources)			
Weekly average	April, 1930		4,629
,, ,,	,, 1931		4,704
Week ended	April 25, 1931		5,297
,, ,,	May 2, 1931		4,421
,, ,,	,, 9, 1931		3,987
,, ,,	,, 16, 1931		4,126
BIRMINGHAM			
Weekly average	April, 1930		466
,, ,,	,, 1931		428
Week ended	April 25, 1931		470
,, ,,	May 2, 1931		438
,, ,,	,, 9, 1931		489
,, ,,	,, 16, 1931		458

* Sides consigned to Lodon.

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

			Number of sides
	LEEDS		
Weekly average	April, 1931		638
Week ended	April 25, 1931		706
" "	May 2, 1931		664
" "	" 9, 1931		702
" "	" 16, 1931		622
	BRADFORD		
Weekly average	April, 1931		420
Week ended	April 25, 1931		474
" "	May 2, 1931		466
" "	" 9, 1931		442
" "	" 16, 1931		424
	HALIFAX		
Weekly average	April, 1931		89
Week ended	April 25, 1931		100
" "	May 2, 1931		83
" "	" 9, 1931		89
" "	" 16, 1931		75

The total number of sides graded and marked for the London area showed a steady improvement during April; in the week ended April 25, 2,429 sides of home-killed beef were graded and marked in the London area. With the exception of the week ended December 20, 1930, when 4,212 sides were graded and marked for the Christmas trade, this is a record figure.

At a recent meeting of salesmen of Scotch beef on Smithfield Market, held to discuss the Scottish grading service, it was stated that the National Mark Beef Scheme had helped to stabilize prices, as prices of Town-killed beef (*i.e.*, beef from Islington Abattoir) had never before remained so level during a period when prices of chilled beef showed violent fluctuations.

Three Scottish producers have, so far, been authorized by the Department of Agriculture for Scotland to have beef graded and marked by the Ministry's graders at Smithfield Market, as recommended by the Bentinck Committee. The first consignment was graded and marked on April 1; 11 consignments (63 sides) have been graded and marked under this arrangement.

It has been suggested by the trade that, in view of the conditions prevailing in the Leeds area, the Beef Scheme should be extended to include a grade for cows. The question has been carefully considered by the Ministry and the London Trade Advisory Committee, and it has been agreed not to create a new grade. The existing grades have, however, been extended to include, in the "Prime" grade, heifers other than maiden

heifers that conform to the requirements in the grade definitions, and, in the "Good" grade, certain young, well finished cows of "Good" standard. The matter will now be considered by the Department of Agriculture for Scotland, the National Farmers' Union and the Trade Advisory Committees of Leeds and Bradford.

National Mark Dressed Poultry.—Early this year, an article appeared in the *Fish Trades Gazette* drawing attention to the pressing need for improvement in the marketing of home-produced poultry, and laying special emphasis on the poor quality of the birds being consigned to market at that time as English chickens. The majority of these birds were matured cockerels which were useless to producers and had been marketed without any attempt at conditioning.

In sharp contrast, imported birds—especially those from Holland—were usually assured of an excellent reception, in many cases being sold before arrival on the market. Large consignments were regularly received, even when good class English produce was out of season, and it was evident from their condition that special attention had been paid to the technique of incubator-hatching and hand-rearing the birds for the table; while the uniform whiteness of skin, a point which appeals to buyers, was further evidence of careful breeding.

It must be admitted that the high class of produce required by the trade is not, as yet, produced in any quantity in this country, but the home-produced supplies now coming forward in unusually large quantities show evidence of endeavour on the part of producers to improve the standard of quality. At the same time, the lack of standardization in grading and packing is a severe handicap in the competition with imported supplies.

Under the National Mark Dressed Poultry Scheme, large-scale packing stations are being gradually developed with the object of supplying standardized consignments of dressed poultry packed to well-defined grades in standard packages. Supplies are now being dispatched to the London market and reports indicate that they are establishing a sound reputation.

National Mark Tomatoes and Cucumbers.—A number of fresh applications for authorization in the scheme has recently been received, while there is evidence that existing packers intend to pack under the National Mark larger quantities of their crop than last year.

The interest shown in the scheme by market salesmen is denoted by the recent offer of a leading London salesman to supply an approved type of National Mark label for tomatoes at his own expense to those of his suppliers who are authorized packers. The Ministry has accepted the offer, experimentally, for the present season, and the conditions upon which the arrangement is to operate have been agreed.

National Mark Strawberries.—Gratifying evidence of the support given to the National Mark movement by distributive organizations is afforded by the letter which was published in a recent issue of the *Market Grower and Salesman* over the signature of the Secretary of the Retail Fruiterers' and Florists' Association, Ltd. The Association proposes, for the assistance of its members, to compile and publish a list of salesmen handling National Mark strawberries during the season; to this end, growers who are authorized packers in the scheme and who intend to market their produce under the Mark, are asked to supply the Association with the names of the salesmen to whom their fruit will be consigned. The Association expresses the hope that growers will assist the National Mark scheme and so help to foster a long-needed reform in the trade.

Additional applications for enrolment in the scheme are now being received from strawberry growers.

National Mark Cider.—Four further Certificates of Authorization have been issued to the following approved packers :—

James Norris (Burslem), Ltd., Burslem, Staffs.
Godwin's Cider, Ltd., Hereford.
Thos. Peatling & Sons, Ltd., King's Lynn, Norfolk.
Findlater, Mackie, Todd & Co., Ltd., London.
A. J. Caley & Son, Ltd., Norwich.
Backs, Ltd., Norwich.

The scheme is now in operation and, judging by the demand for labels, a considerable quantity of National Mark cider should now be available for distribution. Over 3,000,000 official labels have been issued; in addition, by licence from the Ministry, one packer is having 2,000,000 labels printed for his own use, and 9 packers are incorporating the National Mark design in their private brand labels. As some of the most well-known manufacturers are included among the nine packers, the number of private brand labels to be used will be considerable. The indications, therefore, point to the successful launching of the scheme.

Proposed National Mark Scheme for Bottled Home-Grown Fruits and Vegetables.—Following the favourable reception of the National Mark scheme for canned fruit and vegetables in its first year by all sections of the trade, as well as by the general public, the Ministry has received numerous representations in favour of the early extension of the National Mark programme to bottled fruits and vegetables. At a recent meeting, the National Mark Canned Fruit Trade Committee passed a resolution urging the Ministry to give the matter very early attention. A good deal of information has been collected as the result of preliminary inquiries made of fruit bottlers, bottle manufacturers, distributors and others, and it is thought that no special difficulty is likely to arise in the way of introducing a scheme for bottled produce.

It will, however, require further time for the completion of inquiries and for consultations with the interests concerned. These should be completed in 1931 in time to permit of the introduction of a National Mark scheme for bottled fruits and vegetables early in 1932.

Publicity for National Mark Produce.—On the occasion of a joint Empire Shopping Week held in Lewes and other towns in East Sussex in the week commencing May 4, a public meeting was held in the Town Hall, Lewes, on May 4, at which Viscount Gage presided, and speeches on the National Mark were delivered by Mrs. L. Manning, M.P., and Rear-Admiral T. Beamish, M.P. On May 7, displays of National Mark films were given in a local cinema hall. Local publicity was also undertaken in association with the Ministry's marketing demonstrations at the Bath and West Agricultural Show, Bristol (May 20-23), and the Shropshire Agricultural Show, Shrewsbury (May 27-28), and also with a display of National Mark products at the Cheltenham Empire Exhibition and Festival (May 25-27). At Bristol, publicity took the form of Press advertising; at Shrewsbury, Press and hoarding poster advertising; and at Cheltenham, Press advertising, a shop window display competition, and displays of National Mark films at local cinemas.

Arrangements are well forward for the holding of National Mark Shopping Weeks in connexion with marketing demonstrations to be staged at the following Agricultural Shows: Royal Counties, Portsmouth (June 3-6); Royal Norfolk, Great Yarmouth (June 17-18); and Great Yorkshire, Huddersfield (July 14-16); while shop-window display competitions are being arranged in connexion with similar demonstrations

at other Agricultural Shows as follows: Three Counties, Hereford (June 9-11); Lincolnshire, Lincoln (June 24-26); Peterborough (June 30-July 2), and the Royal, at Warwick (July 7-11).

As part of the programme of continuous publicity for National Mark beef which is being followed in the areas concerned, a personal letter from the Minister was sent to some 20,000 housewives in Leeds at the end of May, suggesting that they should specify "National Mark" when purchasing beef and other commodities for which there are National Mark schemes.

During May, advertisements were inserted in trade journals circulating amongst fruit growers and fruit salesmen, emphasizing the value to them of the National Mark schemes for tomatoes and cucumbers, strawberries and cherries. A personal message from the Minister on behalf of National Mark canned fruits, together with an appropriate advertisement, appeared in the Canning Supplement issued by a London evening newspaper on May 6. In the latter part of the month, a series of National Mark advertisements in certain women's journals was commenced.

Wide publicity was arranged to coincide with the first arrivals on the market of National Mark cider by means of advertisements in the trade press, circular letters to hotel keepers, caterers and retailers of cider, and also by means of notices to the Press. A film illustrating the manufacture of National Mark cider has been prepared and is being displayed at Agricultural Shows at which the Ministry is exhibiting, and on other occasions as opportunity offers. An abridged version is being shown as part of the Gaumont Mirror throughout the entire Gaumont circuit in this country. A short "talkie" film has also been prepared in which the Minister delivers a short speech describing the merits of the National Mark with special reference to cider. This film is included in the Paramount Company's News Reel and is being displayed at a number of cinema halls throughout the country.

Three propaganda leaflets were issued during May as follows: The National Mark: A Record of Achievement for Egg Producers (Marketing Leaflet No. 6h), which contains some striking facts regarding the progress of the National Mark Egg Scheme and its value to producers; Marketing Leaflet No. 22a, which calls the attention of wine and spirit merchants, licensed victuallers, caterers, grocers and others to the merits of National Mark cider; and Marketing Leaflet No. 25 (revised), which contains a symposium of the views of well-known fruit growers,

fruit salesmen and retailers with regard to the National Mark fruit schemes. Copies of these leaflets may be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

The National Mark Flour Cookery Competition arranged under the joint auspices of the Ministry and the National Federation of Women's Institutes is drawing to a close so far as the County Competitions are concerned. Twenty-one of these have already been held, and six are outstanding. The Competition has aroused considerable interest, and in one county contest alone there were a thousand entries, nearly two hundred of which qualified for the proficiency certificates which are being awarded by the Ministry. The final stage of the Competition will be reached in September, when the County Federations which have held individual competitions will take part in an Inter-County Competition to be held at the Grocers' Exhibition at the Royal Agricultural Hall.

A Huddersfield butcher has adopted the idea of a travelling van fitted as a shop for the sale of meat in the surrounding country. As regards beef, he has decided to sell only the National Mark product; he has been supplied with display material for decorating his van and with leaflets for distribution to his customers.

Displays of National Mark Produce.—Displays of National Mark produce were staged during May as follows :—

Lewes Town Hall in conjunction with the public meeting mentioned above. (May 4.)

Messrs. Barrows Stores, Birmingham. (May 4–15.) This was made possible by the offer of suitable space by this important firm of provision merchants.

Empire Festival and Exhibition held in the Cheltenham Town Hall. (May 25–27.)

Marketing Demonstrations.—Marketing demonstrations were given by the Ministry during May as follows :—

Bath and West Show, Bristol—May 20–23—National Mark Hall, Cheese, Honey, Cider.

Shropshire Show, Shrewsbury—May 27–28—National Mark Hall, Cheese, Honey.

In the National Mark Hall, all the National Mark schemes so far initiated were demonstrated by means of a display of the commodities concerned, graded and packed in accordance with the requirements of each particular scheme.

The cider demonstration, which formed a special feature of the Ministry's exhibit at the Bath and West Show, was prepared by the National Fruit and Cider Institute of the University of Bristol, and showed the various stages in the manufacture of

cider, with special reference to the requirements of the National Mark Cider Scheme.

The cheese section included a representative display of English and foreign cheese, and illustrated a method of applying the National Mark to cheese.

The honey demonstration showed suggested grades, standard packages and cases for honey and a method for the application of the National Mark to honey.

The cheese and honey demonstrations are to be repeated at a number of the principal Agricultural Shows throughout the season.

Grading of Ware Potatoes: Cooking Quality.—In connexion with proposals that have been discussed for a National Mark scheme for potatoes, the question was raised of the difficulty of grading potatoes without a means of determining easily their quality in the matter of blackening after cooking.

Arrangements were accordingly made some months ago by the Ministry for experiments to be carried out at King's College of Household and Social Science, Kensington, with the object, *inter alia*, of discovering a simple test which, when applied to the raw potato, would indicate whether it would show a dark discoloration when cooked. The experiments have not yet been completed, but the results have so far been satisfactory and seem to indicate that the above requirements may probably be met by a comparatively simple chemical test which can be carried out in a few minutes on the farm, in the market or elsewhere. The results, if successful, should be of some economic importance and should be particularly helpful in promoting a more precise classification and grading of ware potatoes.

A New Method of Marketing Asparagus in the Vale of Evesham.—The following short note is intended to outline briefly how asparagus growers have set about the task of improving the marketing of their produce.

The Growing Area.—The most important asparagus growing centre in England and Wales is situated in and around the district of Badsey, on the border of Worcestershire, where several hundred acres of this crop are grown, chiefly by smallholders. A large percentage of the asparagus is marketed through the Littleton and Badsey Growers, Ltd., an association of growers having its headquarters at Blackminster, near Evesham.

The Old System of Marketing.—In the past, it has been usual for asparagus growers to grade and pack their asparagus

with the aid of members of their family, the Association being relied upon, in certain cases, to make arrangements for the consigning of members' packages in bulk to salesmen, thereby arranging cheaper rail facilities and maintaining, as far as possible, a continuity of supply.

The small lots of asparagus cut day by day were sorted by the growers into three or four different grades, such as "prue" (the smallest), "ordinary," "best" and "giant." These grades were by no means uniform and varied between grower and grower, and amongst the produce of the same grower at different times of the season. The "ordinary" grade of one grower might well be the "best" of another or the "prue" of a third. Moreover, owing to the relatively small quantity of asparagus cut daily by each grower, it was usually necessary to place in the same package a varying number of bundles of each grade. This practice led to confusion at the wholesale markets to which produce was consigned, and mistakes were made which under a better system of packing could have been avoided. The busiest period at such a market is usually during the early morning, when the commission salesman and his staff are busy attending to the wants of buyers and cannot afford the time spent in opening out each package in order to inspect and check the contents, as had to be done. Buyers, too, are in a hurry to be away and chafe at any delay or obstacle which hinders the purchase of goods, or which introduces an unnecessary element of speculation into a sale.

For some time past, therefore, it has been recognized that such a system of marketing does not adequately meet the needs of the trade, and places the home product at a disadvantage compared with imported asparagus, which is tied in bundles of suitable size for the average consumer and can be purchased in non-returnable crates containing a recognized number of bundles.

The New System.—The Association realized that the only way to ensure absolute uniformity of pack was by the introduction of centralized grading and packing, or, in other words, by the formation of an asparagus pool, which operates in the following manner.

The growers place their asparagus, as cut, loose and ungraded, into boxes provided by the Society. The several lots are collected and taken to the packing house. On arrival there, the asparagus is graded and the weight of each grade sent in by the grower is noted. Once weighed, the identity of the asparagus is no longer maintained. At the end of the

day, the weights of each grade sent in by each member are converted into terms of bundles. After grading, the asparagus is bundled, washed, wrapped and packed in non-returnable crates, and consigned to various markets. There are three principal grades, each of which is distinguished by a wrapper of a different colour. On these, the trade-mark of the Society appears, together with the words "Worcestershire asparagus grown in the Vale of Evesham." Two other grades are also marketed, namely, "prue" and "giant." The grade of asparagus is largely determined by the diameter of the buds.

Supplies and Marketing.—In 1930, asparagus was dispatched to markets on 59 days during the period April 28 to July 4; 32 growers supplied produce, and during the season over 40 tons of asparagus were made up into over 40,000 bundles, and marketed through the pool. Nearly four-fifths of the total quantity marketed passed through the pool during the five weeks ended June 21. The bulk of the asparagus was marketed in London.

There is general agreement that the experiment met with the approval both of the grower who participated and of the salesmen who handled the produce; it is, in fact, being repeated this season with the support of a larger number of growers.

The Society was assisted in this experiment by the Ministry, both as regards technical advice and financial aid.

New Zealand: Marketing of Dairy Produce.—The Dairy Produce Export Control Act was passed in 1923, and, after an affirmative vote of producers, the Control Board, consisting of 9 producers' representatives (3 of whom retire annually), 2 Government nominees and 1 representative of merchant and proprietary interests, was established. For the season of 1926-7, the third year of the Control Board's operations, all butter and cheese was pooled, according to grade, and sold through the Board, minimum prices being fixed for the British market. Owing to disagreements, this innovation was discontinued, in the following year, in favour of a system of limited control, based on the licensing of exporters; this latter system is still in operation. Recent discussions, however, show that a strong section of opinion favours another advance towards centralized marketing with, at first, a system of voluntary pooling.

The cause of the failure of the first pooling and price-fixing experiment is still a matter of controversy, but it has been attributed to the fixing of prices by the London distributing

agency for the sale of produce to wholesalers at a level which could not be maintained on account of alternative sources of supply.

Under the present system, dairy companies are permitted to export, under licence from the Ministry of Agriculture, provided they agree to ship and to insure under the direction of the Board, and to store the produce in Great Britain in warehouses approved by the Board, which takes elaborate steps to regulate supplies. The Board is financed by levies on the butter and cheese exported, the present rates being $3\frac{1}{2}d.$ and $1\frac{3}{4}d.$, respectively, per cwt. The income of the Board in 1929-30 was £40,000. An efficient inspectorate is in operation, and a small publicity staff is maintained, which also does a certain amount of market investigation. Approximately £15,000 per annum is spent on advertising, the Board holding the opinion that "it is absolutely necessary to make New Zealand produce more widely known." It was recently decided to form an advisory committee in London, representative of the Board and of the London importers, to deal with special marketing problems as they may arise, as well as to develop publicity and sales.

Norway : Marketing of Bacon.—With the object of promoting the co-operative marketing of bacon, milk, cheese and butter, a temporary Act was passed in June, 1930, providing for the establishment of a Marketing Council to be financed by means of levies on home-produced bacon and milk. This Act was brought into effect in January, 1931, by a Royal Resolution, which also confirmed regulations imposing a levy on milk delivered during the year beginning March 1, 1931. (See Marketing Notes in the issue of this JOURNAL for April, 1931—Vol. xxxviii, pp. 75-6.) By a Royal Resolution of March 13, 1931, effect has now been given to regulations imposing a levy on the sale of pig's carcasses. The levy has been fixed at Kr. 1.50 (1*s.* 8*d.*) on each whole carcass and 75 øre (10*d.*) on each half carcass (or less) which passes the official meat control inspection during the twelve months beginning May 1, 1931. It is estimated that this levy will yield Kr. 300,000 (over £16,000) per annum, which will be available for promoting the sale of bacon.

A new organization of bacon curers, to be known as "Norges Fleskecentral," is about to be set up to stimulate the production and consumption of bacon and to control the home market by exporting and, if necessary, preserving any surplus that may occur. It is hoped to secure the support of producers

of not less than 80 per cent. of the bacon marketed in Oslo, which market is said to dominate the local markets in other parts of the country. This new organization will nominate one member of the Marketing Council.

Germany : Grading Act for Agricultural Produce.—In view of the fact that Germany is a large importer of food-stuffs, it will be of general interest to note that the Reichstag has recently passed a Grading Act which corresponds in essentials to the Agricultural Produce (Grading and Marking) Act, 1928, in this country. This Act came into force on December 1, 1930.

The Act forms part of the Government's general plan of legislation for the assistance of agriculture, partly by measures of commercial policy and partly by regulations aimed at securing better marketing and increased consumption of certain important commodities. In addition to enabling the Imperial Government, with the consent of the Reichsrat, to issue orders for the establishment and maintenance of statutory but non-compulsory grades for agricultural commodities, the Act also provides for the extension of the law with regard to warehouse receipts and for the amalgamation, if necessary compulsory, of sugar and potato factories. The provisions with regard to amalgamations are dealt with in a separate Note. The following is a translation of the text of the Act so far as it relates to grading :—

SECTION I.

GRADES.

Sub-Section 1.—The National Government, with the consent of the Reichsrat, may define grades for agricultural products, including horticultural and viticultural products, and the products of the bee-keeping and fishing industries. These shall indicate minimum standards. Human food-stuffs and animal feeding-stuffs *produced by manufacturing processes* are included in the term "agricultural products."

The grades introduced under the provisions of this Act shall be statutory grades.

Sub-Section 2.—If products are offered or exposed for sale, sold, or otherwise brought into the market as products of statutory grades, it shall be taken as a warranty that those products possess the properties indicated by the grade definitions.

Sub-Section 3.—Where prices are quoted on Exchanges for products for which statutory grades have been established, the National Government, with the consent of the Reichsrat, may order that the prices shall be quoted according to statutory grades.

Further, in other cases where prices of agricultural products are regularly determined and published, the National Government, with the consent of the competent State Government, can require those concerned to determine and publish those prices on the basis of the statutory grades.

Sub-Section 4.—The National Government, with the consent of the Reichsrat, may, for products for which statutory grades have been established, make orders with regard to the marking of the

products and of the packages containing them and with regard to uniform packing and the units in which the products shall be handled in the wholesale and retail trades.

Sub-Section 5.—Before the introduction of statutory grades and before the issue of orders under Sub-Sections 3 and 4, the evidence of expert representatives of the interested parties shall be taken.

Sub-Section 6.—For the purpose of inspecting products graded according to the statutory grades, inspection stations shall be set up and administered jointly by duly authorized representatives of agriculture, trade and industry. The appointment of Inspectors shall be subject to the approval of the supreme authority in each State or of some authority designated by it.

The Inspectors shall—

(*a*) at the instance of the interested parties or at the request of the authorities or courts, inspect goods in respect of their statutory grade classification and issue certificates of inspection;

(*b*) at the request of any concern, carry out a continuous supervision of the grading of its products according to statutory grades;

(*c*) issue certificates guaranteeing the classification of goods according to statutory grades in cases where such certificates are prescribed for the grades in question.

(*d*) where necessary, check the grading of goods by means of random samples.

To cover the costs of inspection, fees may be charged.

The National Government, with the consent of the Reichsrat, shall issue the requisite instructions for putting into effect the provisions of this sub-section. In agreement with the State Governments concerned, it shall make arrangements for the uniform performance of the inspection service in all parts of the Empire.

Where no instructions are issued by the National Government, the supreme authorities in each State shall be responsible for more detailed instructions.

SECTION II.

WAREHOUSE RECEIPTS.

Sub-Section 7.—(This section deals with the extension of the law relating to warehouse receipts.)

SECTION III.

AMALGAMATIONS.

Sub-Sections 8 *and* 9.—(These sub-sections provide for the amalgamation of sugar and potato factories—see note below.)

SECTION IV.

PENALTIES.

Sub-Section 10.—It is an offence, punishable by not more than three months' imprisonment or by a fine or by both—unless higher penalties are prescribed for it in other enactments (1) deliberately to offer or expose for sale, sell or otherwise bring into the market, any products, in contravention of an official certification under Sub-Section 6, as being of another statutory grade for which higher prices are paid; (2) deliberately to offer or expose for sale, sell or otherwise bring into the market products acquired under a given statutory grade as being products of another grade for which higher prices are paid, unless those products do, in fact, reach the standard of such other grade; (3) deliberately

to fail to perform any duty imposed under Sub-Section 3, paragraph 2.

In the case of (1) and (2), in addition to the penalty prescribed, the articles in respect of which the contravention occurred may be confiscated. Confiscation may also be made where punishment is inflicted under the terms of other enactments.

Sub-Section 11.—The National Government, with the consent of the Reichsrat, may order that the contravention of regulations issued under the terms of this Act shall be punishable with imprisonment, not exceeding three months, or by a fine, or by both, and that, in addition, the articles in respect of which such contravention occurred may be confiscated.

Sub-Section 12.—This Act shall come into force on the day of proclamation.

The objects of the grading provisions are stated in an explanatory memorandum to the Act to be to assist German agriculture to overtake its competitors in the production of high quality goods and thus gradually to reduce the large imports of these goods that are at present necessary. In view of the fact that conditions vary with different commodities, only enabling powers are given. The grades, when established, are to be applicable throughout Germany and to be administered as uniformly as possible. The Act also makes provision for regulating the marking of graded produce and the packages and units in which graded produce is sold.

To ensure that the grades established shall be generally acceptable, the evidence of expert representatives of the interested parties (growers, traders and consumers' organizations) must be taken before the introduction of the grades. In order to secure the wide use of the statutory grades, the Government may compel produce exchanges and other institutions quoting prices to quote in terms of these grades.

If the introduction of statutory grades is to have the desired effects, it is realized that there must be a far-reaching guarantee that the products marketed as graded produce really conform to the grade definitions. For reasons of expediency, it is impossible to make it the general rule that products may not be marketed under statutory grades unless they have been actually inspected as such. On the other hand, in view of the fact that where produce is marketed according to statutory grade, a warranty is implied that that produce does conform to the grade definition, the possibility of expert inspection must be assured in every case. The Act, therefore, provides for the establishment of inspection stations to be administered jointly by professional representatives of agriculture, trade and industry. No new Government machinery is proposed; it will be possible to employ for these inspection stations the

machinery of the independent organizations of agriculture, trade and industry. The actual administration of these stations will be chiefly confined to the appointment and supervision of the inspectors who are to carry out the inspection under their own name and on their own responsibility. It is contemplated that the administration of the stations will be carried on in close touch with the professional and trades organizations concerned.

The expenses of the inspection stations are to be covered by the charging of fees for their services.

It is recognized as particularly important that the inspection service should be conducted on uniform lines throughout the Reich, so that every purchaser, wherever he may get his produce, may be certain that it comes up to its grade standard. For this reason the National Government is required to make arrangements with the State Governments for the uniform performance of the inspection service in all parts of the German Republic.

Persons contravening the Act may render themselves liable either to criminal or civil proceedings. Criminal proceedings, are, however, confined to cases where deliberate fraud can be proved (see Sub-Section 10), and the penalties are set as low as possible. Civil law proceedings are to be the chief means of enforcing the Act. In this connexion, Sub-Section 2 of Section 1 is important. It provides that persons selling or offering for sale products as being of a statutory grade are held to give a warranty that that produce conforms with the statutory grade definition. Under German civil law, where goods do not come up to the quality guaranteed by the vendor, a purchaser may demand damages for non-fulfilment of contract instead of the substitution of other goods or a reduction of price.

German Grading Act: Provisions as to Amalgamations of Sugar and Potato Factories.—Section 3, Sub-Sections 8 and 9, of the German Grading Act, outlined above, provides for the amalgamation, in certain circumstances, of sugar factories and potato manufacturing concerns by the National Government with the consent of the Reichsrat. The following is a translation of these two sub-sections of the Act :—

The objects of these provisions are set out in the explanatory memorandum to the Act as follows :—

> *Sub-Section* 8.—The National Government, with the consent of the Reichsrat, may amalgamate sugar factories and potato manufacturing concerns with the object of regulating production and marketing, provided that the majority of the concerns give

their consent. In taking such action, it shall aim at securing the most efficient operation of the industry, and at the same time avoiding injury to the general economic welfare.

The Decree of November 2, 1923, against the misuse of monopolistic powers, shall be applicable to such amalgamations, but no notification, as needed under Section 8 of that Decree, shall be required.

Sub-Section 9.—The National Government, with the consent of the Reichsrat, may issue regulations for putting into effect Sub-Section 8. It may, in particular, (1) regulate and define the rights and duties of members and the legal status of the amalgamations in other respects, by the declaration that the amalgamations are lawful bodies; and (2) combine concerns with already existing amalgamations if those concerns are of the same nature, and at the same time regulate the rights and duties of the constituents of such amalgamations, even to the extent of altering their original contractual agreements.

Now that German sugar beet culture is about as far developed in the present Reich area as it was in pre-War years, there are once more considerable sugar surpluses in years of average yield, and under conditions of unlimited production and unregulated marketing these lead to serious depression of prices in the home market and heavy losses on exports. During the last few years, the German sugar industry has been seeking, by means of marketing agreements, both in the home and the export trade, to lessen the disadvantages accruing to German sugar-beet culture from this state of affairs. In the season 1930-31, after long negotiations, new contracts were concluded. Whether and on what terms such agreements will be made in the future is uncertain, but it is a matter of great concern to the German sugar-beet growing industry, and to the national economy as a whole, that the losses which result from inadequate organization in this sphere, and which in the last resort are borne by the beet growers, should be avoided as far as possible. In particular, efforts should be made, firstly to adjust German sugar production as far as possible to German sugar consumption; and, secondly, to enable German agriculture to utilize the feeding-value of the sugar contained in the surplus beet excluded from manufacture.

These views are appreciated by the sugar industry, and it is to be hoped that in the next few years a majority of the factories will agree upon contracts in accordance with these principles. In order to prevent such arrangements being frustrated by the action of a minority or by the abstention of individual factories, the National Government, with the consent of the Reichsrat, is to be empowered under Sub-Sections 8 and 9 to amalgamate the sugar factories, *compulsorily* if necessary, for the purpose of regulating production and marketing. It is emphasized in Sub-Section 8, paragraph 2, that such measures must not lead to the artificial maintenance of uneconomic conditions.

Conditions in the potato-drying and potato-starch industries are similar to those in the sugar industry. In spite of various attempts at voluntary amalgamations, neither of these industries is yet sufficiently organized to fulfil its function of absorbing and manufacturing the surplus of normal potato crops, so as to lessen the pressure on the potato market. In view of the upward trend of the potato crops, this function is becoming increasingly important. Long experience under the present conditions of

unorganized utilization of potatoes indicates that, without amalgamations, it is impossible to ensure the systematic manufacture of potatoes and the organized disposal of potato products. In the potato-starch industry, negotiations are already on foot which it is believed will combine the majority of the parties concerned on a voluntary basis. In the potato-drying industry, efforts are also being made to effect an amalgamation. Should these attempts to achieve unity by voluntary agreement be unsuccessful, the powers granted under Sub-Sections 8 and 9 are also to be applied to these industries.

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LITTER-TESTING AND PIG-RECORDING

THE Minister of Agriculture and Fisheries, in issuing the following Report of the Pig Industry Council, desires to express his appreciation of the care which the Council has given to the consideration of the subject, which is of fundamental importance to the pig industry.

The immediate application of the Council's suggestions would, however, involve expenditure on a new service for which money is not available at the present time. Accordingly, the Minister has reluctantly decided that the question of giving effect to the Council's recommendations must be deferred. The Report will, however, be considered again as soon as circumstances become more favourable. In the meantime, the Minister hopes that the Report, dealing as it does with matters of increasing interest to all connected with the industry, will receive a wide circulation.

REPORT TO THE MINISTER OF AGRICULTURE AND FISHERIES BY THE PIG INDUSTRY COUNCIL

(1) In its first interim report* the Pig Industry Council recommended the establishment of litter-testing stations at which trials relating to the rate of growth and quality of carcass can be conducted under standard conditions of management and feeding, and that there shall be an advanced register based on commercial utility. The Ministry thereupon asked the Council to appoint a Committee to report on, in further detail, the questions of the establishment of litter-testing stations and advanced registers, and these matters were referred to the Breeding Committee of the Council for consideration and report.

(2) Very early in the consideration of these matters the Breeding Committee found that it would be desirable to consider at the same time the question of pig-recording. This subject is therefore included in this report.

(3) The Breeding Committee has had the benefit of consultation with one of the staff of the Litter-Testing Station of the Animal Breeding Research Department, University of Edinburgh, and with the Organizers of the East Anglian Pig-Recording Scheme.

(4) The Council recommends that litter-testing and pig-recording schemes should be supervised, controlled and, if necessary, periodically amended in detail by the Ministry with the assistance of an Advisory Committee.

Litter-Testing Stations.—(5) The stations should preferably be attached to suitable agricultural institutes.

* Marketing Leaflet No. 15.

(6) Progeny of any pedigree breed to be accepted for testing, preference being given to the breeds specified in para. 9 (D) (i) of the Council's first report, the parents of such pigs to be registered in the herd book of the breed society. It should be at the discretion of those in charge of the station to accept first cross pigs.

(7) Pigs should not be accepted from litters of less than six pigs (dead or alive) in the case of gilts, or eight in the case of sows, but should the number of pigs offered for testing at any time be more than the stations can accommodate, preference should be given to litters from sows which have had on the average the largest litters.

(8) Four pigs from each litter (two males and two females if possible) should be sent for testing, and these should be selected by an official of the recording society or testing station, and should be as near the average of the litter as possible.

(9) It is suggested that litters should be accepted only from persons owning at least six sows.

(10) The litters should be weighed at three weeks old. If a pig recording scheme is in operation, litters will be accepted only from sows recorded under the scheme. If no pig recording society is available, other arrangements will have to be made to provide for weighing at three weeks old.

(11) Litters should be accepted only from sows which have not less than 12 teats and which have been passed as satisfactory on previous inspection. The following scale of points could be used as the basis of such inspection :—

General quality	*Maximum Marks*	
Form, length and smoothness	15	
Hair, skin and bone	10	30
Feel and alertness	5	
Fore-end		
Head and neck	8	
Shoulders, breast and forelegs	12	20
Middle		
Back, loin and ribs	21	
Side and flank	12	33
Gammon		
Rump, ham and hindlegs	17	17
	100	

(12) Pigs should be sent to the station at eight weeks old, boar pigs to have been castrated not less than 10 days before sending.

(13) The housing, rations and methods of feeding should be the same at all stations.

(14) The station should test pigs for both pork and bacon, sender to notify which he wishes. Porkers should be killed when the average fasted live weight of all the pigs from the litter is 120 to 130 lb. and baconers when the average weight is 195 to 220 lb.

(15) Tested stock should be graded into three grades on a scale based on (*a*) milking qualities and prolificacy of sow, (*b*) economy of growth at testing station and (*c*) carcass quality. One-third of the total marks might be given to each of (*a*), (*b*) and (*c*) with a total of 100 as maximum, and the grading be : Grade 1, 75 marks or over ; Grade 2, 60 to 75 marks ; Grade 3, 45 to 60 marks.

(16) The owner of the litter should be furnished by the litter-testing station with a report setting out the result of the test, such report to state the grade allotted to each pig and to include particulars of the rate

of growth, food consumption, live weight at slaughter, dead weight, bacon weight, grade of carcass before curing and quality of fat after curing.

(17) When a litter from any sow has been tested, subsequent litters from the same sow may be tested at the discretion of those in charge of the station.

(18) Regulations will be required to prevent as far as possible the receipt of infected pigs, and provision should be made for veterinary inspection of the pigs in the stations.

(19) The Treasury should be asked to provide the capital expenditure on the provision of buildings.

(20) Pigs to be tested should be purchased from the breeder at two-thirds of the current local market price, but it would help the scheme if the Treasury would authorize purchase at full market price for the first one or two years.

(21) Any loss incurred in operating a station should be borne by public funds, which, in turn, should be credited with any profits.

(22) Estimates of running costs vary very widely. In the opinion of the Council there should be little, if any, loss over a period of years, but losses in any one year might be as high as £600 for a station of 65 to 70 pens.

Pig-Recording

(23) The Council is informed that the Ministry has no objection, in principle, to pig-recording being undertaken by milk-recording societies and recommends that in any area where the number of recorded pigs is not sufficient to warrant the formation of a separate pig-recording society the recorders employed by milk-recording societies should be allowed to check the records of pigs, if suitable arrangements can be made.

(24) It would be desirable that all breeding sows belonging to a member of a pig-recording society should be recorded, but to commence with, it might be left to the option of herd owners as to what sows they record. This regulation to be subject to reconsideration after experience of recording has been obtained.

(25) All recorded pigs should be earmarked.

(26) Records to be kept of number of pigs at birth (alive and dead), number and individual weight at three weeks, number weaned, live weight when sold off the farm, and age at disposal. The recording society should also make provision, where possible, for recording live weight at slaughter, dead weight, bacon weight, grade of carcass before curing, and quality of fat after curing, and this should be encouraged so far as it does not interfere with the free market for the farmer.

(27) If the recorder is not at the farm on the day the pigs are three weeks old, the farmer should weigh and record the weight of the pigs, such weight to be checked by the recorder as near that date as possible.

(28) The cost of recording is estimated at not more than 10*s*. per sow; towards this it is suggested that the Treasury might make grants at the rate of 5*s*. per sow.

Advanced Registers

(29) It is hoped that breed societies will make use of the particulars obtained from litter-testing for advanced registers supplementary to their herd books, and the following suggestions are made for the guidance of breed societies :—

(*a*) Only pigs whose progeny have qualified through a testing station should be eligible for the advanced register. The progeny of stock entered in the advanced register might be entered in a preliminary register and be transferred to the ad-

vanced register when they themselves have qualified through the testing of their own litters.

(*b*) There should be an indication of its "Grade" against each pig entered in the advanced register.

(*c*) In order to qualify for entry in the advanced register a boar should have sired five recorded litters of which at least two have been tested.

(*d*) Pigs which have qualified for the advanced register should have a distinguishing mark.

FOLKESTONE, *Chairman.*
May 21, 1930.

Copies of the above report (Marketing Leaflet No. 30) may be obtained, free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

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NOTES ON PRICES AND SUPPLIES

R. J. THOMPSON, C.B., O.B.E.,
Late Assistant Secretary, Ministry of Agriculture and Fisheries.

PRICES in the second week of May showed minor fluctuations as compared with a month earlier, the changes being frequently of a seasonal character. Wheat tended steadily upwards, though the gain on the month was small. Wool fell below the level of February last. All commodities, except potatoes, remained definitely cheaper than they were last year.

The comparative prices ruling a month ago and a year ago are shown in the following table* :—

	Prices in second week in		
	May 1931	*April* 1931	*May* 1930
	s. d.	s. d.	s. d.
Wheat, Gazette average, per cwt. ..	5 8	5 3	8 9
Fat cattle, 1st quality, per cwt. ..	48 11	48 9	55 0
Beef, English N.M. Prime, per lb. ..	7¾	7¾	9¼
,, Argentine, Chilled H.Q. per lb.	6⅝	6	7⅝
Fat sheep, 1st quality, per lb. ..	1 0¾	1 0½	1 3
Mutton, English, per lb.	11¾	11⅜	1 1⅜
Lamb, New Zealand, per lb. ..	7¼	7	8¾
Fat pigs, 1st quality, baconers per score	13 4	13 7	17 4
Bacon, Danish Green, per cwt. ..	84 0	85 0	106 0
Fat pigs, porkers, per score ..	15 5	16 0	19 2
Pork, English, per lb.	9½	10¾	1 0¼
Cheese, English Dairy Cheddar, per cwt.	106 0	106 0	124 0
Cheese, New Zealand, per cwt. ..	51 6	56 6	88 0
Eggs, N.M. Standard, per 120 ..	10 6	10 6	12 6
Potatoes, King Edward (Lincs. and Yorks) per ton	190 0	205 0	80 0
Wool, Southdown, per lb. (at Bradford	1 0	1 1½	1 3½
Maize, Argentine, per cwt.	5 2	5 3	7 2

* The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending May 13, 1931, and in corre-

As compared with a year ago the average decline in the prices of the principal products sold by farmers as indicated by the Ministry of Agriculture's Index Number for April was 10 per cent. Feeding stuffs were 17 per cent. lower, while fertilizers were unaltered. A better indication of the change is obtained, however, if the comparison is made with April, 1929, that is before the present general decline had commenced; this shows that in the last two years the prices of the products sold off the farm have fallen on the average by nearly 16 per cent. and feeding stuffs by 39 per cent. In fertilizers the variation has been small. Agriculturists in other countries seem to have suffered from the fall in prices to a much greater extent than has been the case here; indeed, in some of the overseas countries for which index figures are available the decline is remarkable. Comparing the average of the first quarter of the current year with the corresponding period two years ago, prices in New Zealand show an average drop of 42 per cent., in Argentina of 39 per cent., in Canada of 38 per cent., and in the United States of 32 per cent. In Europe, several countries show somewhat similar figures, the two most favourable being Germany and Holland with decreases of 20 and 23 per cent., respectively.

Wheat.—During the past few weeks, the general market sentiment has been slightly more optimistic, chiefly in response to prospects of larger buyings by European countries, but up to the middle of May there was no appreciable change in the general position. The Liverpool July future, which may be taken as reflecting the trend in international prices, stood at 4*s.* 7¼*d.* per 100 lb. on May 14 as compared with 4*s.* 6⅛*d.* a month earlier. Only small supplies of English wheat have been on offer, and prices have risen by about 6*d.* per cwt.

The demand for wheat continues good and there is every prospect that shipments from exporting countries will be made on a liberal scale until the end of the cereal year, thus helping to reduce the abnormally large stocks on hand. The total (including flour) shipped to all destinations during the present season (August 1, 1930, to May 9, 1931), as calculated by the *Corn Trade News*, amounted to 75,580,000 qr. as against 58,883,000 qr. last season. Germany, after raising the quota of foreign wheat which millers are allowed to use in their grist from 35 to 50 per cent. has granted a temporary rebate on the import duty. France has also increased the proportion of foreign

sponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

wheat from 20 to 25 per cent., and owing to short home supplies it is likely that this percentage will be further raised. Larger quantities should, therefore, be taken by these two countries. In the case of the United Kingdom, the low prices seem to have had the effect of inducing a somewhat larger demand, as the imports of wheat (including wheat flour expressed as wheat) in the eight months of the present season (September to April) have amounted to 19,980,000 qr. as against 18,020,000 qr. Of this increase of nearly two million qr., 900,000 qr. were needed to make good the shortage in last year's harvest; the remainder has apparently gone into consumption in one form or another, as Port stocks are now no larger than they were a year ago.

Although shipments continue to be made from Russia, there has so far been no revival of export on a large scale.

As regards the next harvest, available information is limited, and it is not possible at present to get any general idea of the probable tendency, though advance statements tend to confirm the expectation that the area sown in Argentina, Australia and Canada will be reduced. The United States Report on the winter wheat crop issued on May 8 gave the area standing as 40,432,000 acres against 38,676,000 acres last year, and also raised the previous estimate of probable yield to 653 million bushels as compared with 604 million bushels harvested last year. No information beyond that given last month is so far available as to the spring crop. In Canada, conditions for seeding have been favourable; the area intended to be sown with spring wheat is officially estimated at 22,152,000 acres as against 24,082,000 last year. In Russia, the late spring has considerably retarded sowing, but how far this will influence the area finally sown remains to be seen. The crop in India, which has just been harvested, is estimated as yielding 43,660,000 qr. as against 48,700,000 qr. a year ago and 39,700,000 qr. in 1929. France shows a small reduction in acreage, and the condition of the crop there and in several other importing countries in Europe is reported to be only moderate.

Cattle and Beef.—The quality of the fat cattle on offer during the past four or five weeks has been fairly good, and prices rose from about 48*s.* 3*d.* per live cwt. in March to 48*s.* 11*d.* in the middle of May, but at this level they were about 11 per cent. below the rates ruling at this season during the past two years. As explained in these notes last month, the recovery which usually takes place in the spring after the lower autumn prices, has so far failed to materialize except to the small extent indicated above, and it now seems too late to expect any appreciable improvement.

Veal calves, which usually realize the best prices from April to June, have been in demand, good prices being realized, but on the average rather less than a year ago.

Although fat cattle are materially cheaper than last year, store stock do not seem to have fallen proportionately, the average price calculated by the Ministry of Agriculture for yearlings and two-year olds for the month of April being £15 4*s*. 0*d*. against £15 7*s*. 0*d*. in 1930. Last year store stock bought at these prices realized when off the grass in the autumn about 48*s*. to 50*s*. per cwt. first quality. It is not, of course, possible to say how prices will be next autumn, but in past years the October-November prices have been lower than those ruling in the preceding April-May. If this trend holds this year, the October-November prices for fat cattle will be below present rates, though quite possibly the decline may be small.

There is some indication that more cattle are being reared. Throughout the greater part of 1930 and up to the present time, demand for rearing calves has been good and prices have generally tended to advance. This may foreshadow an increase in the total herds of the country which it will be remembered have been decreasing for the past three years, the number returned in June last being 430,000 less than in 1927. An increase is very desirable as the number of young stock under one year was lower in June, 1930, than in any year since 1923, and nearly 12 per cent. lower than in 1926. These young cattle form the reservoir from which is drawn the supply of heifers and older cattle, and if a permanent reduction in the herds of this country is to be avoided it follows that their numbers need to be increased.

Sheep, Mutton and Wool.—The number of fat sheep and lambs shown at certain representative markets in recent weeks has been rather light for the time of year, and prices for sheep were rather firmer, though still much lower than at the same time in the past three years. Lambs have also realized lower prices this season, the average for April being about 19½*d*., against 21*d*. per lb. in 1930, while the seasonal decline reduced them to 17¾*d*. in the week ending May 13.

The depressing influence of the heavy imports of frozen lamb was referred to last month; the quantities received in April from New Zealand, Australia, and the River Plate were again very large, bringing the total for the four months of 1931 up to 6,809,000 carcasses as against 4,888,000 in the same period of 1930. Receipts in the ensuing few weeks are likely to be lighter, as the shipments afloat on May 10 were only 1,150,000 carcasses

as against 2,190,000 a month earlier, while the number of lambs slaughtered in New Zealand in April was also reduced as compared with the preceding three months. The stocks of lamb in New Zealand in store or loaded at the end of April were, however, quite large, viz., 2,180,000 carcasses against 2,000,000 last year. London prices for both Canterbury and Australian lamb improved.

British wool has lost most of the recent advance, and Southdown is quoted at Bradford at 12*d.* per lb.

Pigs, Pork and Bacon.—Fat pig prices showed no material change during April, though porkers in the early part of May were weaker. At this season of the year, prices normally decline with the falling off in the demand for pork, and some decrease is therefore to be expected. The lowest point in this seasonal decline is usually reached in July.

The imports of bacon in April were again exceptionally high, amounting to 888,000 cwt. and making a total for the seven months October, 1930, to April, 1931, of 6,095,000 cwt., a monthly average of 870,000 cwt. The increase in the supply of bacon can be appreciated by comparing this figure with the monthly average of 690,000 cwt. for 1929 and 736,000 cwt. for 1928. About 70 per cent. of the current supply comes from Denmark, and up to the present there is no sign of any immediate reduction in supplies from this source. Killings this year up to May 8 were being well maintained at an average of 122,400 per week as compared with a weekly average of 93,400 in the same period of last year, an increase of 31 per cent. The market has apparently had no difficulty in absorbing these heavy supplies, and the price of Danish bacon is now above the very low level to which it fell in February last, the average for that month being about 64*s.* 6*d.* per cwt., whereas 84*s.* was realized in the week ending May 13. The price of bacon received from several competing countries is much below that of Danish; Polish bacon, for example, which is now reaching this country in quite considerable quantities, is quoted at 46*s.* to 48*s.* per cwt.

The markets appear to have been fairly well supplied with store pigs, the numbers shown at representative markets in the first 19 weeks of the year up to May 13 having been 185,000 as against 150,000 and 161,000 in the corresponding period of 1930 and 1929. Demand has been firm, but in sympathy with pork and bacon pigs prices have shown a weakening tendency and are decidedly less than at this time last year, the average for all grades of store pigs in April

being 38*s.* 9*d.* per head as compared with 50*s.* 8*d.* in the same month of 1930. In the two preceding years, the corresponding prices were 40*s.* 8*d.* in 1929 and 32*s.* 3*d.* in 1928. In comparing these prices the cost of feeding at the different dates is an important consideration, and this naturally fluctuates not only with the price of the materials themselves but also with the selection of the different foods used. As an example of the variation in the cost of feeding materials at different dates a mixture may be taken made up of 55 per cent. barley meal, 20 per cent. coarse middlings, 15 per cent. maize meal, and 10 per cent. oats. This at the prices ruling in the first week of May, 1931, would have cost about £6 10*s.* 0*d.* per ton as against £6 16*s.* 6*d.* and £9 14*s.* 0*d.* at the same date in 1930 and 1929 respectively. The position then is that store pigs, this spring have been about 12*s.* a head cheaper than in 1930, while a suitable feeding mixture has cost slightly less per ton; as compared with 1929, store pigs have cost about 2*s.* per head less, while the feeding mixture is over £3 per ton cheaper.

The other question the store feeder has to consider is the probable price which fat pigs, either baconers or porkers, will fetch when the pigs he buys as stores are ready for market. On this it may be said that when prices for fat pigs are low, as is the case at present, the normal summer drop is sometimes small; in 1928, for example, when rates were somewhat comparable with those now ruling, prices for porkers fell very little after May. In the case of baconers, October-November is usually the time of lowest prices, and in 1928 the drop from May was about 1*s.* 1*d.* per score in October, and 1*s.* 5*d.* per score in November. The prices of fat pigs this year may show the same general tendency.

Butter.—Butter at country markets is realizing very poor prices, the average in the middle of May being about 1*s.* 3¼*d.* per lb. Last year the lowest average recorded was 1*s.* 4*d.* per lb. and this was in June, the month in which the supply is usually at its highest and prices correspondingly at their minimum. Farm butter has to some extent a market of its own, though the price realized is, of course, influenced by the rates obtained for imported grades, and during the past few weeks these have been exceptionally low. Poor prices have, in fact, been the rule for a long time now, the level throughout 1930 being much below that of 1929, while since October last both New Zealand and Australian butters have been sold at unprecedentedly low figures. The average of finest New

Zealand salted in November last, for example, was only 110*s.* 6*d.* per cwt. as against 174*s.* 6*d.* in the same month of 1929, and although in the succeeding months there was some recovery, prices fell away again in April, and in the middle of May the top price returned by the London Provision Exchange was only 106*s.* per cwt.

Butter has been arriving in this country in large quantities, the supplies received in the first four months this year being above those of any corresponding previous period.

	Imports of butter in four months, January to April cwt.
1931	2,506,000
1930	2,318,000
1929	2,296,000
1928	2,197,000

The larger receipts have been almost entirely due to heavy imports from New Zealand and Australia, particularly the latter, and the quantities from these two sources taken together have amounted to 1,395,000 cwt. as against 1,124,000 cwt. last year. Argentina also increased her export slightly. The season of the heaviest imports from the Southern Hemisphere is now over, and although there are considerable quantities to arrive, receipts should be on a reduced scale until about November when the new season's shipments from Australia, New Zealand and Argentina begin to arrive. This seasonal decrease is usually made up by imports from the Irish Free State, which are received from May to November, and by somewhat larger imports from Denmark and Northern Europe. The season has been rather backward generally, but in spite of this, Denmark increased her exports to the United Kingdom in April by about 9 per cent. Receipts from Russia have so far been small, but in some years appreciable, though rather erratic, supplies come from this source, chiefly Siberia; in 1929, for example, the total amounted to 290,000 cwt.

Demand has evidently been much stimulated by the prevailing low prices, and for some months the apparent consumption (*i.e.*, the quantities passing into the hands of retailers and distributors) has been exceptionally high; in the four weeks ended May 2 it amounted to approximately 648,000 cwt. as compared with 463,000 cwt. during the same period in 1930. The situation in this respect seems quite different from what it was a year ago. During the period from February to June, 1930, a proportion of the butter

imported was stored instead of going into consumption, with the result that the stocks in cold storage rose steadily from 325,000 boxes in January, 1930, to 1,194,000 boxes at the end of June, from which date they progressively declined to a minimum of 235,000 boxes in January, 1931. Although imports have been larger, no such movement has taken place this year, and on May 2 the butter in store amounted to 363,000 boxes as against 853,000 boxes at the same date in 1930. The large quantity in store last year was, no doubt, an important factor in bringing about the drop in prices in the autumn, when the considerable quantities remaining in store threatened to come into competition with new season's supplies. That position does not seem likely to arise this year.

Cheese.—English Dairy Cheddar has shown some seasonal rise this spring, though the increase has been slight, and prices for some weeks up to May 13 have been unchanged at 106*s.* per cwt. (1st quality, London), or about 12 per cent. below the rates ruling at the same date last year. Factory Cheddar is much more depressed and is realizing only 62*s.* per cwt. Cheshire Cheese prices, as is usual at this season of the year, have been declining, and rates towards the middle of May were lower than those ruling in 1930, ungraded new cheese at Liverpool being quoted at 77*s.* per cwt. against 79*s.* 4*d.* last year, while graded at 84*s.* per cwt. compared with 86*s.* 4*d.* last year.

Imported cheese is realizing very poor prices, with the result that the May price fixed for manufacturing milk under the current milk scheme at sender's railway station fell as low as 4½*d.* per gallon. This price is based on the average price of Canadian and New Zealand cheese for the previous month, less 2*d.*

The imports of cheese from New Zealand in the first four months of this year have shown little variation, amounting to 865,000 cwt. against 889,000 cwt. in the similar period of 1930. They represent about 84 per cent. of the total imports as the Canadian receipts are small until June. Prices are remarkably low, New Zealand in the middle of May realizing about 51*s.* 6*d.* and Canadian 79*s.* per cwt. against 88*s.* and 105*s.* per cwt. respectively at the same period last year. The fall in New Zealand cheese is about 40 per cent., whereas Canadian has only declined by 25 per cent. The receipts into store in New Zealand are now showing a seasonal decline, and the supplies coming forward should begin to be on a

smaller scale. Stocks in London in May were, however, reported to be large at 203,000 crates against 129,000 crates last year.

Potatoes.—The high prices obtainable for potatoes have continued to draw heavy imports to this country, the receipts in the eight months, September, 1930, to April, 1931, amounting to 190,000 tons, a figure that is higher than in any year since 1924-25, though in the corresponding period of 1927-28 about 150,000 tons were imported. These figures include consignments from the Irish Free State, but in addition about 75,000 tons have been sent from Northern Ireland, so that the total receipts have approximated to 10 per cent. of the production of England and Wales. Three-quarters of the foreign supply has come in almost equal proportions from Holland and Germany. Demand was slackening in the early part of May, but substantial shipments were still being received; prices for 1st quality, both German and Dutch, were about 120*s.* per ton in London. Deliveries were also being made from other North European countries.

The receipts of new potatoes, chiefly from Spain and the Canaries, have also been larger than last year, and the prices realized for Spanish have been lower. It is reported that the Jersey new potato season will be at least two or three weeks later than usual.

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JUNE ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

General.—There is no period of the year when farm activities are more varied, according to the district and mode of farming, than June. In the south it is one of the busiest months of the year. Mangold and beet thinning and hoeing are at their height, bare fallows must be worked, there is cultivation and seeding of swedes and turnips, and on top of all haymaking is proceeding.

In the north, except in potato-growing areas, work is not so pressing, and the hoeing of root crops does not overlap the main haymaking season.

Hay.—The production of hay for sale was formerly an important source of revenue on many farms, and influenced the type of farming near the big cities where large quantities were required. Since the war the demand for hay for consumption by horses in the towns has rapidly declined, and, with a greater grass area and consequently a greater potential supply, the

possibilities of maintaining remunerative prices are reduced.

Hay, however, is a valuable food on the farm, and is the basis of the winter rations. No produce of the farm is more varied in character and feeding value; its variable quality gives rise to difficulties in its economical use. Good hay can provide for full maintenance and also assist in production, thus affording opportunities for economy in the use of concentrated foods, whereas inferior hay may provide less than maintenance and may even be harmful. Any forage plant that can be readily dried under ordinary climatic conditions to a moisture content of 15 per cent. or under can be made into hay.

Many and various crops are used for conversion into hay, including pure leguminous crops such as trifolium, red clover, lucerne, sainfoin and vetches; mixtures of cereals and legumes, such as oats with vetches and peas; and mixtures of grasses and clovers, as in "mixed seeds" and meadow grass.

The feeding value of hay depends on the nutritive value of the green crop, the condition at the time of cutting, the method of making, the weather conditions experienced, and the changes during storage.

The nutritive value of the green plant depends to a great extent on the species and variety. Leguminous plants are richer in protein than grasses, but there is also a variation within the species. The main difference which affects the feeding quality is the proportion of leaf to stem. Leaves are considerably more nutritious than stems. Quality of soil and mode of manuring have their influence on nutritive value. Dry soils and soils starved of nitrogen will produce relatively less leaf, and in the case of nitrogen starvation the protein content of grasses will be below normal. Meadow hay is influenced to a greater extent by soil and manurial conditions than a pure crop of a temporary character. Under permanent pasture conditions the plants that survive and predominate are determined by soil conditions, which include both water and mineral foods. A good mixture of clovers and grasses is desirable. An important factor in determining the nutritive value of hay is the age of the plant when cut. In general the nutritive value of the common forage crops is highest in the young stages of growth and greater in the leaf than in the stem; as the plant reaches maturity the proportion and indigestibility of the fibre increases. The aim is to cut at a stage when the digestible nutrients are at the maximum amount and for individual plants this is considered to be just when the plant is coming into flower. In the case of mixed herbage a

difficulty may be experienced in deciding on the best period; it is always wise to err on the early side, especially if weather conditions are suitable.

If it were possible to dry green forage without loss it is believed that the digestibility and nutrient content would be practically unaltered. In practice such an end cannot be attained. The first loss which occurs is when the plants are cut and whilst still green and moist; respiration continues and the nutritive material is diminished. Under cool moist conditions, when "making" is slow, young grass may lose as much as 10 per cent. of its dry matter in 10 days. Another unavoidable loss is the breaking off of part of the plants. Fine leaves, which are the parts richest in nutrients, dry quicker than the stems and are readily broken off. Washing by rain also diminishes the nutrients, and this is more pronounced if the grass has been partially dried before the rainfall occurs. The practice of cocking hay is designed to avoid loss in these directions. If the cocks are well made the partially dried grass is exposed to the air and wind, whilst in the event of rain storms the greater part of the rain runs off. Modern machinery is not well adapted for such a practice, but where pure clovers and lucerne are concerned the extra labour and cost is justified.

The liability to lose nutrients is not finished when the hay is stacked. New hay sweats for six or eight weeks after being stacked. In districts with a moist climate it is not safe to put a large bulk of hay together until this sweating has nearly ceased, and temporary field cocks containing as much as 10 to 15 cwt. of hay are commonly employed to meet the difficulty. In the drier districts the hay is stacked in bulk as soon as it is dry enough. Grass that has been cut in a young state requires more time to dry before it can be stacked than with more mature herbage; although apparently dry, it is apt to sweat more than matured grass. It is desirable that a little heating and sweating should take place, as this ensures that the hay will set tighter and avoid cavities and looseness which might allow the hay to become dry and brittle or allow moulds to form. Temperatures of from 100-140° F. in the centre of the stack ensure tightness and give a pleasant flavour. Should the temperature rise much higher means should be taken to check the rise either by turning the stack or cutting holes to cool down the mass. The larger the stack, the more will heat develop. The rise of temperature is at the expense of the nutrients, and in excessive

heating the material which remains becomes less digestible. The degree of heating is reflected in the colour and ranges from light brown to dark brown and black. Hay that is black is poor, indigestible material, and may give rise to loss if fed to stock, especially calves and milking cows.

Haymaking as practised to-day is a triumph for machinery. The grass mower, swath turner, side delivery rake, collectors or sweeps, and elevators or hoists enable manual labour to be reduced to a minimum. The prospect of being able to bale the hay in the field is alluring, and if found practicable will effect further savings and reduce the cost of handling at every stage between the field and the stock.

What a contrast all this is from the methods practised in Middlesex about the beginning of the nineteenth century! At that time mowing by scythe was the initial step and a good workman would mow from three-quarters to one acre per day. For each mower five haymakers were required so that six workers would be required to deal with approximately 20 acres of hay in a month. In the haymaking process the hay was repeatedly spread and turned by day and put into small cocks at night. This was repeated until the hay was ready for stacking, which in favourable weather was the fourth day after cutting. Such a method preserved the colour, and as no doubt the hay was produced mainly for sale there were compensations for the care exercised.

Aftermaths.—The fresh growth after cutting a hay crop is variously named. In some districts it is called fog or foggage, but these names are also applied to grass which is uncut and ungrazed during summer to provide winter grazing.

The aftermath which is the fresh growth after cutting for hay is very often not so well utilized as it should be. Early cutting of meadow grass for hay could be justified on the sole grounds that it enables the aftermath to be used at a time when young fresh growth is a material advantage to stock. The most common mistake is not feeding the aftermath early enough. If left too late, the grass becomes less palatable, and there is more wastage by the treading of stock, the final result being that it is not fed down bare enough and a matted condition develops. In many districts the value of the aftergrass is thoroughly appreciated, and it is not uncommon for a late dressing of nitrogenous manure to be given to ensure a good growth.

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PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended May 13				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	10 0*d*	10 0*d*	10 0*d*	10 0*d*	12 11
Nitro-chalk (N. 15½%) ..	*	9 7*d*	9 7*d*	9 7*d*	9 7*d*	12 1
Sulphate of ammonia :—						
Neutral (N. 20·6%).. ..	*	9 10*d*	9 10*d*	9 10*d*	9 10*d*	9 3
Calcium cyanamide (N. 20·6%)	*	8 18*e*	8 18*e*	8 18*e*	8 18*e*	8 8
Kainit (Pot. 14%)	§	3 8*a*	2 19*a*	2 19*a*	3 3*a*	4 6
Potash salts (Pot. 30%) ..	§	5 6*a*	4 18*a*	5 0*a*	4 19*a*	3 4
,, (Pot. 20%) ..	§	3 17*a*	3 9*a*	3 8*a*	3 12*a*	3 7
Muriate of potash (Pot. 50%)..	§	9 17*a*	9 3*a*	9 2*a*	9 7*a*	3 9
Sulphate ,, (Pot. 48%)..	§	11 19*a*	11 6*a*	11 5*a*	11 7*a*	4 9
Basic slag (P.A. 15¾%)‖ ..	§	2 13*c*	2 3*c*	..	2 9*c*	3 1
,, (P.A. 14%)‖ ..	§	2 7*c*	1 16*c*	1 16*c*	2 3*c*	3 2
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	§	3 11	..	3 9	3 1	3 10
,, (S.P.A.13¾%)	§	3 5	2 15	3 3	2 15	4 0
Bone meal (N.3¾%, P.A.20½%)	§	8 15	7 10	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	5 5*f*	6 0	4 15	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, for delivery during the month, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

* * * * * *

NOTES ON FEEDING STUFFS

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Surplus Milk for Stock Feeding. The high prices now being realized for calves for rearing indicate that many farmers are utilizing surplus milk for calf feeding. While good store stock continue to be scarce and relatively dear, the rearing of calves and raising of young cattle should prove to be a comparatively sound proposition, and one to be encouraged in preference to the placing of surplus milk on the liquid milk market.

The value and need of milk for calf rearing is recognized, and it is not proposed to deal here with details of calf rearing. It may be opportune, however, to refer to the special value of milk in the rearing of pigs.

The Scandinavian farmer has an advantage over the average pig raiser in this country, because in Denmark and southern Sweden it is almost invariably possible to obtain, without difficulty, supplies of separated milk or whey for pig feeding. In Denmark the separated milk is usually pasteurized at the creamery before being returned to the farmer who supplied the whole milk. In this way measures are taken to prevent possible infection of the pigs with tuberculosis.

Whole milk, separated milk and whey are valuable pig foods. The inclusion of milk or a milk product in a pig ration normally results in improved rate of growth, fewer checks and disorders, less trouble with minor ailments and so on. The results of a series of experiments in the use of whole milk and separated milk in pig feeding, carried out at four centres, are described in a recent report* by Dr. Chas. Crowther. From the data obtained in these experiments Dr. Crowther has calculated that with a cereal ration costing about 10*s.* per cwt., and bacon pigs making 16*s.* per score, the value of whole milk for bacon production may be from 7*d.* to 11*d.* per gallon, and for separated milk from 4½*d.* to 9*d.* per gallon.

These figures strike one as being high, and on examining the methods by which they were arrived at, one is inclined to think that they are rather too favourable to the value of milk. One hesitates to suggest to pig feeders that, at current prices of pork and bacon, they are likely to be able to cash their milk as pork or bacon at figures which even approach those indicated. Nevertheless, the report serves to show the importance and

*This JOURNAL, Vol. 37, No. 6, Sept., 1930, p. 541.

value of milk products for pig feeding, and points to the desirability of a wider use of both whole and particularly separated milk for this purpose. Many practical pig feeders recognize that at this season of the year, when the weather has become warmer, when there is ample sunlight, and fresh green food, as well as some milk or whey, available for pigs, pig feeding becomes altogether easier and more satisfactory. Pigs of all sorts and ages thrive and "do" better under the more favourable weather conditions, and more especially when provided with some milk products in their food.

In Denmark it is not usually customary to feed large quantities of separated milk. Highly satisfactory and, it is claimed, the most economical results in commercial bacon production are secured when separated milk and meal are used in the proportion $1\frac{1}{2}$: 1, or roughly 1 gallon of separated milk to about $6\frac{1}{2}$ lb. of a suitably balanced meal mixture.

Feeding for Egg Production.*—In the Northamptonshire Egg Laying Trials conducted at this Farm Institute, the average egg production in the period of 48 weeks was, in 1928-29, 208·57 eggs per bird, and in 1929-30, 206·08 eggs per bird. These figures for actual egg production were the highest in the County Trials in England for both the years concerned, although in the second year the Somerset Trials scored more points, as calculated on the Ministry of Agriculture's scale. In each of the two years, with a total of 240 birds at the outset, the Northamptonshire Trials showed remarkably low average death rates, namely, 3·7 per cent. in 1928-29 and 5·8 per cent. in 1929-30.

In view of these results it may be of interest to examine the feeding throughout the two years. The birds were housed in small houses, 6 birds in each house, allowing 4 sq. ft. of floor space per bird. An area of just over 20 sq. yds. of grass run per bird was provided. In general the system of feeding was the same throughout both years, although minor variations were made from time to time as necessitated by the condition of the birds.

Corn.—1 oz. of corn per bird was fed in the morning in the litter, and 1 oz. of corn in the evening in troughs. The normal corn mixture was as follows (parts by weight) : 1 clipped oats, 2 wheat, and 2 kibbled maize.

Wet Mash.—2 oz. of wet mash were fed at mid-day.

*Report of the County Egg-Laying Trials, 1928-29 and 1929-30. County Farm Institute, Moulton, Northampton.

Dry Mash.—The dry mash hoppers were left open from mid-day onwards.

The normal wet and dry mash mixtures were made up as under—parts by weight :—

Wet Mash.	*Dry Mash.*
1 Fish Meal.	1 Fish Meal.
1 Bran.	2 Bran.
3 Sharps.	3 Sharps.
2 Sussex Ground Oats.	2 Sussex Ground Oats.
1 Maize Meal.	2 Maize Meal.
1 Alfalfa Meal.	
1 Biscuit Meal.	

The average total food consumption per bird in 1928-29 was 4·9 oz. per head per day, and in 1929-30, 4·75 oz. per head per day. The excess of receipts for eggs over the cost of food was :—

1928-29 .. 19*s.* 6*d.* per bird.
1929-30 .. 16*s.* 1*d.* per bird.

A supply of oyster-shell grit was provided *ad lib.*, but no special mineral mixture was fed. Fish meal was relied upon as the source of minerals, and formed 10 per cent. of the mash portion of the ration throughout.

Edible Fish Meal.—A comprehensive booklet dealing with Edible Fish Meal* has been published in British Columbia, edited by R. De Lisle of the Department of Agriculture. The booklet covers very fully the composition, value and use of fish meal as a feeding stuff for various classes of stock—cattle, pigs, sheep and poultry. It is suggested that the principal reason why fish meal is not more widely employed by the agricultural community is that complaints have been made that fish meal taints the product. It is pointed out that these complaints have arisen on account of lack of care on the part of feeders in selecting suitable brands, and failure to restrict the use of fish meal to a sufficiently small proportion of the ration. It will be generally agreed that when really good brands of white fish meal are employed, when their use is limited to not more than 10 per cent. of the ration, and when, in the case of pigs, the fish meal is omitted altogether in the last fortnight or three weeks before slaughter, no complaint due to tainting should arise.

It is doubtful, however, whether the American writer is correct in asserting that the less extensive use of fish meal is mainly due to a fear of damaging or tainting the product. One finds that farmers hesitate to employ fish meal more widely

*Province of British Columbia, Fisheries Dept., Victoria, B.C.

simply because of its relatively high cost. Many careful users of fish meal, including some of those who fully realize its value, have sought to economize in the cost of rations by reducing or eliminating fish meal, and by replacing it with a protein-rich vegetable food such as soya bean meal in conjunction with a mineral mixture.

Experience may ultimately show that a vegetable food lacks the essentially valuable qualities of fish meal for purposes of feeding to breeding pigs and to poultry, and the choice of a vegetable food in preference to fish meal should be made only after the fullest consideration of the cost of the food stuff, in relation to the results obtained, as judged from all standpoints.

In regard to the special value of the protein content of fish meal, the book claims that the data given indicate that the tyrosine, arginine, histidine, and lysine content of fish and milk proteins are about the same. In general, the proportions of amino-acids found in fish proteins are approximately the same as those found in milk, except that the proteins of fish are low in glycine, an amino-acid not essential in the diet. Fish proteins are thus specially valuable sources of nitrogenous substances for the nutrition of man and other animals—more especially carnivorous animals—for they are complete proteins lacking only in the simple amino-acid glycine, which can apparently be formed in the body by the splitting of other amino-acids.

Dr. J. B. Orr is quoted as regards the value of the minerals in fish meal. "Fish meal, being made from bones and flesh, contains all the mineral matter in the proportion to form these. It will be seen that the ratio of lime to phosphorus in fish meal is not unlike that in sow's or cow's milk. The percentages, however, are so high that comparatively small amounts of fish meal added to a ration yield a sufficient supply of these." The words "in the proportion" quoted above may be specially significant. In the present light of our knowledge about the feeding of minerals, it would seem that the special safety of fish meal as a source of mineral matter depends upon the balance or proportion of its mineral ingredients.

* * * * * *

Description	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	5 15	0 11	5 4	72	1 5	0·76	9·6
Barley, British feeding	—	—	5 15	0 9	5 6	71	1 6	0·80	6·2
„ Canadian No. 3 Western	17 9	400	4 18§	0 9	4 9	71	1 3	0·67	6·2
„ Danubian	19 9	„	5 10	0 9	5 1	71	1 5	0·76	6·2
„ Persian	18 6	„	5 3*	0 9	4 14	71	1 4	0·71	6·2
„ Russian	19 9	„	5 10	0 9	5 1	71	1 5	0·76	6·2
Oats, English, white	—	—	6 17	0 10	6 7	60	2 1	1·12	7·6
„ „ black and grey	—	—	6 5	0 10	5 15	60	1 11	1·03	7·6
„ Canadian Mixed Feed	13 9	320	4 17	0 10	4 7	60	1 5	0·76	7·6
„ Argentine	13 6	„	4 15	0 10	4 5	60	1 5	0·76	7·6
„ Chilian tawny	14 9	„	5 3	0 10	4 13	60	1 7	0·85	7·6
„ „ white	22 0	„	7 13	0 10	7 3	60	2 5	1·29	7·6
„ German	21 6	„	7 10†	0 10	7 0	60	2 4	1·25	7·6
„ Russian	18 6	„	6 10	0 10	6 0	60	2 0	1·07	7·6
Maize, Argentine	23 9	480	5 10	0 9	5 1	81	1 3	0·67	6·8
„ South African	22 6	„	5 5†	0 9	4 16	81	1 2	0·62	6·8
Beans, English Winter	—	—	5 15§	1 3	4 12	66	1 5	0·76	20
Peas, Indian	—	—	8 0†	1 0	7 0	69	2 0	1·07	68
„ Japanese	—	—	18 5†	1 0	17 5	69	5 0	2·68	18
Dari	—	—	8 5	0 11	7 14	74	2 1	1·12	7·2
Milling offals—									
Bran, British	—	—	5 5	1 0	4 5	42	2 0	1·07	10
„ broad	—	—	6 7	1 0	5 7	42	2 7	1·38	10
Middlings, fine, imported	—	—	5 12	0 16	4 16	69	1 5	0·76	12
„ coarse, British	—	—	5 10	0 16	4 14	58	1 7	0·85	11
Pollards, imported	—	—	4 10	1 0	3 10	60	1 2	0·62	11
Meal, barley	—	—	6 17	0 9	6 8	71	1 10	0·98	6·2
„ maize	—	—	6 12	0 9	6 3	81	1 6	0·80	6·8
„ „ germ	—	—	6 5	0 14	5 11	85	1 4	0·71	10
„ locust bean	—	—	5 5	0 7	4 18	71	1 5	0·76	3·6
„ bean	—	—	8 7	1 3	7 4	66	2 2	1·16	20
„ fish	—	—	18 0	3 1	14 19	53	5 8	3·04	48
Maize, cooked flaked	—	—	7 10	0 9	7 1	83	1 8	0·89	8·6
„ gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	8 12	1 8	7 4	74	1 11	1·03	25
„ „ „ 9% „	—	—	8 5	1 8	6 17	74	1 10	0·98	25
„ „ „ 8% „	—	—	8 0	1 8	6 12	74	1 9	0·94	25
Soya bean cake, 5½% oil	—	—	8 2*	1 19	6 3	69	1 9	0·94	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	5 5	1 6	3 19	42	1 11	1·03	17
„ „ Egyptian, 4½% „	—	—	4 15	1 6	3 9	42	1 8	0·89	17
Ground-nut cake, 6-7% oil	—	—	5 17*	1 6	4 11	57	1 7	0·85	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 12	1 19	5 13	73	1 7	0·85	41
Palm kernel meal, 1-2% „	—	—	5 5	0 17	4 8	71	1 3	0·67	17
Feeding treacle	—	—	5 15	0 9	5 6	51	2 1	1·12	2·7
Brewers' grains, dried ale	—	—	4 7	0 17	3 10	48	1 6	0·80	13
„ „ „ porter	—	—	3 17	0 17	3 0	48	1 3	0·67	13
Malt culms	—	—	4 10†	1 6	3 4	43	1 6	0·80	16
Dried sugar beet pulp (*a*)	—	—	4 2	0 8	3 14	65	1 2	0·62	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of April, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N. 8s. 8d.: P_2O_5. 3s. 1d.: K_2O. 3s. 4d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 5
Maize	81	6·8	5 7
Decorticated ground nut cake	73	41·0	7 12
„ cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·40 shillings, and per unit protein equivalent, 1·47 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values " which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 15
Oats	60	7·6	4 15
Barley	71	6·2	5 8
Potatoes	18	0·6	1 6
Swedes	7	0·7	0 11
Mangolds	7	0·4	0 10
Beans	66	20·0	6 2
Good meadow hay	37	4·6	2 19
Good oat straw	20	0·9	1 9
Good clover hay	38	7·0	3 3
Vetch and oat silage	13	1·6	1 0
Barley straw	23	0·7	1 13
Wheat straw	13	0·1	0 18
Bean straw	23	1·7	1 14

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6d. net.

* * * * * *

MISCELLANEOUS NOTES

Visits to Crop Trials

FARMERS and others who may be interested are invited to visit the trials of cereals, roots and other crops now being conducted, under the auspices of the National Institute of Agricultural Botany, at Cambridge, Sprowston (Norfolk), Good Easter (Essex), Long Sutton (Hants), Cannington (Somerset) and Newport (Salop). The best month for such visits is July. Visitors are welcome either singly or in parties, but arrangements should be made in advance by communicating with the Secretary, National Institute of Agricultural Botany, Huntingdon Road, Cambridge.

* * * * * *

Seed-Testing Course and Examination

DURING the past nine years, 106 analysts have attended the seed-testing courses held at the Official Seed-Testing Station, Cambridge. In this period, also, 144 have taken the examination and 71 have been awarded certificates of proficiency. There are now comparatively few commercial analysts who are not well acquainted with the Cambridge methods. The time has come, therefore, when it is no longer necessary to hold the Course and Examination annually, and it has been decided not to hold them in 1931. It is expected that a Course will be arranged to take place about June or July of 1932, but a further announcement on the subject will be made at a later date.

* * * * * *

Seed Analysts' Conference

IN each of the last eight years the National Institute of Agricultural Botany has arranged a conference of seed analysts, to which it has invited representatives of official stations and private licensed stations. The conference has usually followed directly after the seed-testing examination, but the examination is not being held in 1931. Heavy claims are also being made on the time of the officers, principally concerned with the conference, by the International Seed Testing Congress which is to take place in Holland next month (July). In these circumstances, the Institute has decided not to arrange the usual conference at Cambridge this year.

* * * * * *

Colorado Beetle (Amendment) Order of 1931

THE Minister announced in the House of Commons on March 30 that he had decided that it was necessary to take further precautions against the introduction of the Colorado Beetle into this country. The pest has been known to exist in France since 1922, and the regulations at present in force prohibit the importation from France of potatoes, tomatoes and living plants grown within forty kilometres of any place where the beetle has been known to exist. An Order which has been issued under the Destructive Insects and Pests Acts, 1877 to 1927, and which came into force on May 4, 1931, extends this radius from forty kilometres to seventy-five kilometres. Copies of the Order may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

* * * * * *

The Agricultural Index Number

THE general level of the prices of agricultural produce in April was unchanged on the month at 23 per cent. above that of the base years 1911-13, which compares with a fall of 2 points to 37 per cent. above pre-war at the corresponding period a year ago. Price changes were fairly numerous during the month under review, but the effect of those moving in an upward direction was about equal to that produced by those moving downwards. The principal increases were in fat sheep, potatoes and wool, while falls occurred in milk, butter and eggs.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	—
June	48	41	53	40	31	—
July	48	42	45	41	34	—
August	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—The average price of wheat was unchanged at 5*s.* 2*d.* per cwt., but as a rise occurred between March and

April of the base years, the index figure declined by 2 points. Values for barley continued to recede, but the reduction was proportionately less than that recorded in 1911-13, with the result that the index figure was one point higher on the month at 2 per cent. below pre-war. Oats were a little dearer, and the index number appreciated by 3 points to 15 per cent. below the 1911-13 level. As compared with a year earlier, all three kinds of grain were cheaper, wheat showing a reduction of 3*s*. 6*d*. per cwt. and barley and oats 2*d*. and 4*d*. respectively per cwt.

Live Stock.—Quotations for fat cattle were rather higher than in March ; but the index figure was 3 points lower at 20 per cent. above pre-war. Fat sheep also were a little dearer, and the index number rose by 7 points to 37 per cent. in excess of the 1911-13 level. As regards fat pigs, prices of baconers were very slightly lower while porkers showed a drop of 8*d*. per score ; the indices for both descriptions were lower, bacon pigs declining by 1 point and porkers by 6 points. Values for dairy cows were about 10*s*. per head lower on the month, and the index figure fell by 2 points to 28 per cent. in excess of pre-war. Store cattle were rather more remunerative at an advance of about 7*s*. 6*d*. per head and values for store sheep appreciated by nearly 2*s*. 6*d*. per head. For the third month in succession prices of store pigs moved in a downward direction, the decrease for April amounting to close on 3*s*. 6*d*. per head, and the index figure declined by 12 points to 63 per cent. above pre-war. A year ago, store pigs were 113 per cent. dearer than in 1911-13.

Dairy and Poultry Produce.—The average contract price of milk in April declined considerably owing to the change-over from winter to summer prices, but as the extent of the reduction was proportionately less than that which occurred in the base years the index number rose by 3 points to 53 per cent. above pre-war. Butter was somewhat cheaper at 15 per cent. in excess of 1911-13, but cheese was practically unaltered. Eggs continued to cheapen in accordance with the customary seasonal movement, and the index figure fell by 6 points to 18 per cent. over pre-war, as compared with a level of 40 per cent. in excess of 1911-13 in April last. Although fowls and ducks showed a rise in price during the month under review, the index numbers were lower owing to the proportionately greater increases recorded in the base period.

Other Commodities.—Potato prices were fully 30*s.* per ton in excess of those ruling in March, and the index number rose by 12 points to 82 per cent. above pre-war. At the corresponding period a year ago, potatoes at 39 per cent. less than in 1911-13 were only one-third of their present price. Hay showed little change either in price or index number. The recovery in wool prices recorded in March was well sustained during April, the index figure rising by 4 points.

Index numbers of different commodities during recent months and in April, 1929 and 1930, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	Apr.	Apr.	Jan.	Feb.	Mar.	Apr.
Wheat	30	14	—24*	—31*	—30*	—32*
Barley	32	Nil.	3	3	— 3*	—2*
Oats	36	—11*	—16*	—18*	—18*	—15*
Fat cattle	31	33	27	25	23	20
,, sheep	53	56	50	37	30	37
Bacon pigs	73	76	34	31	24	23
Pork ,,	74	80	57	51	46	40
Dairy cows	29	30	33	32	30	28
Store cattle	18	24	28	29	25	23
Store sheep	54	43	48	35	31	31
Store pigs	71	113	114	98	75	63
Eggs	45	40	23	17	24	18
Poultry	38	55	47	44	47	42
Milk	77	58	62	62	50	53
Butter	51	30	14	16	18	15
Cheese	76	41	21	19	23	24
Potatoes	15	—39*	71	73	70	82
Hay	10	30	—8*	—10*	—9*	—10*
Wool	59	3	—22*	—25*	—20*	—16*

* Decrease.

* * * * * *

The National Diploma in Agriculture and the Fream Memorial Prize

THE results are now available of the 32nd annual examination for the National Diploma in Agriculture, which was held in April at the University of Leeds. One hundred and sixty-two candidates presented themselves ; of these only 12 took the whole examination ; 79, who had already passed in certain subjects, appeared for the remaining portion, whilst the remaining 71 sat for a first group of subjects. Sixty-one candidates were awarded the Diploma,

while 30 others passed in a first group of subjects and are thus eligible to sit for the remaining subjects in either 1932 or 1933. No candidate obtained honours this year.

The Fream Memorial Prize, which is awarded in connexion with the examination, goes to Mr. Walter Knox Macfarlane, a student of the West of Scotland Agricultural College. This prize, provided from a fund entrusted to the Ministry as a memorial to the late Dr. Fream, is awarded annually by the Department to the candidate who obtains the highest marks in this examination. The value of the prize is approximately £7, and is devoted to the purchase of books selected by the recipient as best calculated to assist him in pursuing his agricultural studies.

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THE following Press Notice was issued by the Ministry on May 7 :—

Exchange of British and Danish Agriculturists

A scheme is in operation under which a limited number of young agriculturists from Denmark are afforded facilities to live and work on farms in this country in order to study, at first hand, the methods and practice of British agriculture ; it is part of the scheme that an equal number of British agricultural students should have opportunities of working for a few months on selected Danish farms. The students are required to pay their own travelling expenses and to undertake regular work on a farm for a period of from three to twelve months in return for free board and lodging, no money being paid to them for their services. The National Farmers' Union assists in the selection of farms on which the Danish students can be placed and also helps to obtain suitable British applicants for work and study on Danish farms.

In Denmark, the scheme is worked by a Bureau of Agricultural Travel under the Royal Agricultural Society of Denmark. This Bureau has organized, with the assistance of the Danish Foreign Office and the Legations in Copenhagen of the various countries concerned, a series of similar exchanges with other countries ; and the Bureau, each year, places a number of agricultural students of different nationalities with Danish farmers of high standing, on whose farms dairy farming in general, scientific economic feeding of dairy cattle, breeding of dairy cattle (with particular reference to the influence of the bull in the yield of the offspring), general co-operation in production, buying and selling, and so forth, may be studied.

This scheme was inaugurated in 1924, and though Danish agricultural students have taken the maximum advantage of it, few students from this country have visited Denmark. The exchange scheme affords to young British agriculturists a unique opportunity, at a very low cost, of gaining insight into and practical experience of the farming conditions in a highly organized agricultural country, and it is hoped that students of agriculture will avail themselves of this opportunity in larger numbers than they have done hitherto. Those intending to proceed to Denmark for a period of six months or less under the scheme should arrange to go out either early in May or early in November.

In England and Wales agricultural students wishing to take advantage of the scheme should make application through the Principal of a College or Farm Institute (if they have attended either of such institutions), or through the Agricultural Organizer of the county in which they are resident.

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Refresher Course for County Poultry Instructors

IN order that County Poultry Instructors may keep abreast with recent developments in poultry management and research, arrangements have been made with the National Institute of Poultry Husbandry (at Harper Adams Agricultural College) for holding a refresher course in poultry subjects. The course, which will be held at the National Institute from September 21 to 26 next, covers the following subjects : breeding, culling, nutrition, management, incubation and brooding, diseases and marketing.

* * * * * *

The Welsh Goat-Breeders' Association

IT is difficult to assess the goat population of the Principality. In the valley of the Aeron, between Lampeter and Aberayron, it can hardly number less than 200. At the Kilgetty show each year, there is a large entry of high-grade goats, owned principally by the miners of south Pembrokeshire. The estimated number of goats in the district is about 100. One large hospital in the Rhondda Valley keeps a herd of Anglo-Nubians, the milk being consumed chiefly in the children's wards. The Welsh Goat-Breeders' Association, which was formed two years ago, possesses seven first-class pedigree billies, and these are available for stud purposes at a fee within the reach of cottagers and smallholders. This year the Association is offering seven

substantial prizes at recognized summer shows. In Breconshire there has been a distribution of young goats to unemployed miners, and this has proved of material assistance. Several local clubs have been formed and are helping to create interest. Over 200 samples of goats' milk have been tested by the Dairy Bacteriologist in University College, Aberystwyth, the figures for butterfat fluctuating between 3·0 and 8·5 per cent.

* * * * * *

Assistance to the Swedish Sugar-Beet Industry

IN the 1929-30 and 1930-31 manufacturing seasons, the Swedish Riksdag voted a sum to assist the sugar-beet industry with the object of enabling the factories to pay the growers a price, for sugar-beet of 16 per cent. sugar-content, of 2·45 kroner per 100 kilograms (approximately 27*s*. 6*d*. per English ton). The assistance, the rate of which was calculated according to the price of sugar, while being paid direct to the factories, was conditional on the whole of its equivalent being passed on to the grower in the beet price: also on the factory companies making, from their own funds, certain freight contributions to the growers. Factory companies were under obligation to submit their accounts for examination at the end of the year. To receive the premium, the grower must have contracted to grow sugar-beet for several years and to have planted at least 70 per cent., but not more than 100 per cent., of his normal acreage unless his former contracts gave him the right to do so. On account of the fall in sugar prices, and the unusually heavy sugar-beet crop in the 1930-31 season, the original estimate of 3,800,000 kroner (approximately £209,000) was exceeded by over 4,000,000 kroner. Assistance on the basis of the two previous years has been granted to the industry for the forthcoming season.

* * * * * *

Importation of Cherries

WITH the object of preventing the introduction of the Cherry Fruit Fly, the Minister has made an Order under the Destructive Insects and Pests Acts, 1877 to 1927, regulating the importation of cherries into England and Wales during the 1931 season.

Cherries grown in France will be admitted without restriction until June 2, after which date importation will be prohibited except of cherries grown within a small district around Honfleur. Details of this district are given in the Order.

Cherries grown in Italy will be admitted without restriction until June 5, after which date only those grown in the region of Emilia will be allowed to enter; after June 10 the importation of cherries grown in any part of Italy will be entirely prohibited.

Cherries grown in Germany will be admitted until June 29 if accompanied by a certificate of origin; after that date no German cherries will be admitted except those certified not to have been grown south of latitude 53°N. or in East Prussia.

Certificates of origin must accompany cherries grown in any other European country which are imported after June 2.

Copies of the Order may be obtained on application to the Ministry.

* * * * * *

Fruit Tree Pests (West Norfolk) Order of 1931

THIS Order, which was issued on March 28, and which came into operation on March 30, has been made by the Minister at the request of the Norfolk County Council, in consultation with the fruit-growing interests in the county. It enables an officer appointed by the Local Authority to investigate, within the more important fruit-growing districts of the county, cases in which growers of fruit trees complain that fruit trees growing on other premises within the district are likely to cause certain diseases or pests scheduled in the Order to spread to their own trees. If the Local Authority are satisfied that the complaint is justified, the owner of the affected trees may be required to cut out and burn all affected branches or to treat the trees in a prescribed manner.

* * * * * *

Foot-and-Mouth Disease.—No further outbreak has occurred in Great Britain since March 24. The position, as this issue goes to press, is as stated in the May issue of this JOURNAL, viz., that there is no part of Great Britain subject to foot-and-mouth disease infected area restrictions.

* * * * * *

Farm Workers' Minimum Wages.—Meetings of the Agricultural Wages Board were held on April 21, May 4 and May 11, 1931, at 7 Whitehall Place, London, S.W. 1.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders carrying into effect the Committee's decisions.

Cheshire.—An Order continuing the operation of the existing minimum and overtime rates from May 2, 1931, until October 31, 1931. The minimum rate in the case of male workers of 21 years of age and over is 35*s.* per week of 54 hours with overtime at 9*d.* per hour. In the case of female workers of 18 years of age

and over the minimum rate is 6*d.* per hour for all time worked, provided that a female worker engaged for milking shall receive not less than 6*d.* per "meal" (*i.e.*, each occasion on which the worker visits her place of employment for the purpose of milking).

Herefordshire.—An Order continuing the operation of the existing minimum and overtime rates from May 1, 1931, until April 30, 1932. The minimum rate in the case of bailiffs, waggoners, stockmen and shepherds of 21 years of age and over is 36*s.* per week for all time (not exceeding 60 hours) necessarily spent in the immediate care of animals, with overtime at 9*d.* per hour except for overtime employment on Christmas Day and Good Friday where the worker has completed less than 60 hours in the weeks in which Christmas Day and Good Friday fall, when the overtime rate is 2*d.* per hour. In the case of other male workers of 21 years of age and over the minimum rate is 31*s.* per week of 44½ hours in the week in which Good Friday falls, 54 hours in any other week in summer; 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with overtime at 9*d.* per hour. The minimum rate for female workers of 18 years of age and over is 4½*d.* per hour with overtime at 6*d.* per hour except for employment on Christmas Day and Good Friday where a whole-time worker has completed less than 46½ hours in the weeks in which Christmas Day and Good Friday fall, when the overtime rate is 1½*d.* per hour.

Lancashire.—An Order continuing the existing minimum and overtime rates of wages from May 1, 1931, until April 30, 1932. The minimum rates in the case of male workers of 21 years of age and over are as follows: in the Southern Area for stockmen and teamsmen 37*s.* per week of 52½ hours and for other male workers 33*s* 6*d.* per week of 50 hours; in the Eastern Area for all classes of male workers 41*s.* per week of 60 hours; in the Northern Area for stockmen and teamsmen 40*s.* per week of 60 hours and for other male workers 37*s.* 6*d.* per week of 60 hours with overtime throughout the county at 10*d.* per hour. The minimum rate in the case of female workers of 18 years of age and over is 6*d.* per hour for all time worked.

Leicester and Rutland.—An Order cancelling as from May 2, 1931, the existing minimum and overtime rates and fixing fresh rates to come into operation on May 3, 1931, and to continue in force until further notice. The minimum rates in the case of male workers of 21 years of age and over are: in Leicester 34*s.* per week of 56½ hours in summer and 54 hours in winter (instead of 54 hours all the year round as at present) and in Rutland 32*s.* 6*d.* per week of 56½ hours in summer and 54 hours in winter (instead of 54 hours in summer and 50 hours in winter as at present). Overtime is payable in the case of all male workers of 21 years of age and over at 9*d.* per hour on weekdays and 11*d.* per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5*d.* per hour with overtime at 8*d.* per hour for employment on Sunday.

Suffolk.—An Order cancelling as from June 6, 1931, the existing minimum and overtime rates of wages for male workers and fixing fresh rates to operate as from June 7, 1931. The minimum rate in the case of male workers of 21 years of age and over is 28*s.* (instead of 30*s.* as at present) per week of 39½ hours during Christmas week, 48 hours during any other week in winter and 50 hours during any week in summer, with in addition in the case of horsemen, cowmen or shepherds an inclusive weekly sum of

6*s.* in respect of employment up to 10 hours per week on work in connexion with the immediate care of animals. The overtime rate in the case of all male workers of 21 years of age and over is 9*d.* per hour.

Anglesey and Caernarvon.—An Order cancelling as from May 12, 1931, the existing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers and fixing fresh rates in substitution therefor to operate as from May 13, 1931, until further notice. The minimum rate in the case of horsemen, cowmen, shepherds and hwsmyn (bailiffs) of 21 years of age and over is 35*s.* per week of 60 hours (instead of 58 hours at present) and in the case of other male workers of 21 years of age and over 31*s.* per week of 50 hours. The overtime rate in the case of all classes of male workers of 21 years of age and over is 9*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 6*d.* per hour for all time worked.

Merioneth and Montgomery.—An Order continuing the existing minimum and overtime rates of wages from May 2, 1931, until May 1, 1932. The minimum rates in the case of male workers of 21 years of age and over are for stockmen, teamsters, carters and shepherds 34*s.* per week of 60 hours and for other male workers 30*s.* per week of 54 hours with overtime in each case at 9*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour for all time worked.

Radnor and Brecon.—An Order continuing the existing minimum and overtime rates of wages from May 1, 1931, until October 31, 1931. The minimum rate in the case of male workers of 21 years of age and over is 31*s.* per week of 54 hours in summer and 50 hours in winter with overtime at 9*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6½*d.* per hour on weekdays and 7½*d.* per hour on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ending May 14, legal proceedings were instituted against 11 employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Derby ..	Chapel-en-le-Frith ..	0 10 0	—	7 4 8	1
Kent	Ashford ..	*	—	—	3
Lancaster ..	Blackburn ..	0 10 0	1 3 6	80 0 0	1
Salop	Broseley ..	†	2 11 0	19 3 4	4
Somerset ..	Wells	—	1 6 0	15 18 2	2
„ ..	„	1 0 0	0 5 0	16 0 0	1
Wilts	Tisbury ..	5 0 0	1 1 0	29 0 0	3
Yorks, W.R...	Knaresborough	0 10 0	0 7 6	15 15 2	1
„ ..	Halifax ..	4 0 0	—	10 0 0	1
Denbigh ..	Cerrig-y-Druidon	*	—	—	1
„ ..	Llangollen ..	1 0 0	0 5 0	4 0 0	1
		£12 10 0	£6 19 0	£197 1 4	19

* Case dismissed.

† Case of one worker dismissed, and those of the other three dealt with under Probation of Offenders Act.

Brewing Research.—A report of the investigations carried out during 1930 under the Research Scheme of the Institute of Brewing has now been issued and makes interesting reading. The purpose of the work is to obtain reliable information regarding the materials and processes used in the fermentation industries, and the experiments in progress concern the development of new varieties of barley and hops, their drying and packing, manuring and diseases. During the period under review much attention has been devoted to the effect of copper boiling on the antiseptic substances of hops, with particular reference to the flavour and stability of the beer produced. Last year's trials have shown that the Fuggles variety of hops is not immune from the ravages of Downy Mildew. Other important results will be found in this report, copies of which are obtainable from the Secretary to the Institute, Mr. W. H. Bird, F.C.I.S., Brewer's Hall, Addle Street, London, E.C.2.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Bedfordshire : Miss D. M. JONES has been appointed Manageress of the County Egg-Laying Trials, *vice* Miss M. G. SPURR.

Devonshire : Mr. W. WILLIAMS, M.Sc., has been appointed District Lecturer in Agriculture, *vice* Mr. D. C. BOWER, N.D.A., N.D.D.

The temporary appointment of Miss I. M. Unkles, N.D.D., C.D.P., as Instructress in charge of the Travelling Poultry School, has now been placed on an established basis.

Essex : Mr. H. FRASER, N.D.H., F.R.H.S., has been promoted Lecturer in Horticulture, *vice* Mr. C. WAKELY, F.R.H.S., and Mr. O. G. DORLEY, B.Sc., has been promoted to succeed Mr. FRASER as Lecturer and Adviser in Commercial Horticulture.

COUNTY AGRICULTURAL EDUCATION STAFFS : WALES

Brecon & Radnor: Mr. WILLIAM EVANS, N.D.A., B.Sc., N.D.D., Assistant Agricultural Organizer for Merionethshire, has been appointed Assistant Agricultural Organizer for these counties.

SPECIALIST ADVISORY STAFFS

4. EASTERN PROVINCE (Bedford, Cambridge, Essex, Hertford, Huntingdon, Isle of Ely, Lincoln: Holland and Kesteven, Norfolk, Soke of Peterborough, Suffolk).

School of Agriculture, The University, Cambridge

Veterinary Science .. .. Mr. F. BLAKEMORE, M.R.C.V.S., D.V.S.M., has been appointed adviser.

6. SOUTH-EAST PROVINCE (Kent, Surrey, Sussex)

South-Eastern Agricultural College, Wye, Kent

Entomology .. .. .. Mr. S. G. JARY, B.A., Dip.Agr., has been appointed adviser *vice* Prof. F. V. THEOBALD, deceased.

Veterinary Science .. .. Mr. A. D. MCEWEN, B.Sc., M.R.C.V.S., has been appointed adviser.

7. SOUTHERN PROVINCE (Berkshire, Buckinghamshire, Dorset, Hampshire, Isle of Wight, Middlesex)

The University, Reading

Agricultural Chemistry .. Mr. M. N. Nicholson, B.Sc., A.I.C., has been appointed adviser, *vice* Mr. H. H. NICHOLSON.

Entomology .. .. .. Mr. W. E. HODSON, A.R.C.Sc., D.I.C., F.Z.S., has been appointed adviser, *vice* Mr. S. G. JARY.

Veterinary Science .. .. Mr. N. S. BARRON, M.R.C.V.S., has been appointed adviser.

8. SOUTH-WEST PROVINCE (Cornwall, Devon, Isles of Scilly)

Seale Hayne Agricultural College, Newton Abbot, Devon

Entomology .. .. .. Mr. L. N. STANILAND, A.R.C.Sc., D.I.C., has been appointed adviser, *vice* Mr. W. E. HODSON.

Veterinary Science .. .. Mr. C. V. WATKINS, M.R.C.V.S., D.V.S.M., has been appointed adviser.

9. WESTERN PROVINCE (Gloucestershire, Hereford, Somerset, Wiltshire, Worcestershire)

Bristol University, Agricultural Advisory Office, 22, Berkeley Square, Bristol

Head of Advisory Department Prof. J. A. HANLEY has resigned his appointment.

Dairy Bacteriology .. Mr. C. S. MILES, B.Sc., N.D.A., N.D.D., has been appointed adviser, *vice* Mr. C. A. MACEACHARN.

Veterinary Science .. .. Mr. D. W. MENZIES, M.R.C.V.S., has been appointed adviser.

Agricultural and Horticultural Research Station, Long Ashton, Bristol

Entomology .. .. .. Mr. H. G. H. KEARNS, B.Sc., has been appointed adviser, *vice* Mr. L. N. STANILAND.

10. WEST MIDLAND PROVINCE (Salop, Staffordshire, Warwickshire)

Harper Adams Agricultural College, Newport, Salop

Dairy Bacteriology .. Mr. A. L. PROVAN, Ph.D., has been appointed adviser, *vice* Mr. E. L. CROSSLEY.

11. NORTH-WEST PROVINCE (Cheshire, Lancashire)

Victoria University, Manchester

Agricultural Chemistry .. Mr. R. STEWART, B.Sc., has been appointed adviser, *vice* Mr. A. M. SMITH.

13. MID-WALES PROVINCE (Brecon, Cardigan, Carmarthen, Merioneth, Montgomery, Pembroke, Radnor)

Welsh Plant Breeding Station, Aberystwyth

Grassland Adviser .. .. Mr. M. T. THOMAS, B.Sc., has been appointed.

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NOTICES OF BOOKS

A Bibliography of the History of Agriculture in the United States. By Everett E. Edwards. Pp. iv. + 307. (Washington: U.S. Dept. of Agriculture Misc. Pubn., No. 84. 1930. Price 45 cents.)

The story of agriculture in a land of such extent, and so great variations in soil and climatic conditions, as the United States of America is almost an epitome of the agriculture of the world. When to the conditions of size, soil and climate is added the comparatively recent development of what may perhaps be termed white man's farming, the illustrations of problems and their solution that can be drawn from the story are manifestly increased. Changes and developments have taken place within the last century, which is the period covering the complete

exploration and taming of this immense tract of country, that afford many lessons for the agriculturist of other countries. The literature of the subject is voluminous.

All these things make the present bibliography the more welcome. Its arrangement also facilitates reference to the various aspects of the field of study that specialists may desire to consult. Dr. Edwards, who is Associate Agricultural Economist in the Division of Statistical and Historical Research in the U.S. Bureau of Agricultural Economics, very modestly describes the work as "an amplification of a brief list of references prepared in the fall of 1927 for use in a course on the history of agriculture." It seems a very considerable amplification and yields abundance of material for the study of the subject generally, in its sections according to the progressive advance of the whites, in the Indian contribution to agriculture, and for the study of each state individually as well as in specialized connexions such as economic geography, soils, climate and so on. Some 4,000 odd references are listed and an excellent index is provided. Students can hardly demand a more exhaustive guide to the possibilities of research in their various branches of the subject, although the introductory note will warn them that "only in the sections pertaining to agriculture in the strict sense has an effort been made to list more than the main references."

The National Farmers' Union Year Book, 1931. Pp. 608. (London: Published by the Union at 45 Bedford Square, W.C.1. Price 5*s.* net.)

The current issue of this well-known annual contains many features of interest and practical utility to farmers and others who are concerned with agriculture. There are comprehensive chapters dealing with agricultural education and research, income-tax, legislation affecting agriculture, a guide to the Agricultural Holdings Act, 1923, a miscellany of information for tenants and owner-occupiers, and a statistical abstract of wages, prices and supplies. In an article on "Science and Crop Production," Sir John Russell refers to the remarkable progress that has been made in the British nitrogen fertilizer industry, and to the rapid increase in the export of sulphate of ammonia from the United Kingdom which, if continued, must soon bring us into line with our largest Continental competitor. Mr. A. W. Street again records developments of the National Mark Scheme, and Dr. R. M. Woodman writes on "The Compatibility of Fungicides and Insecticides," while the final sections summarize the Union's multiform activities.

The Gardener's Year Book, 1931. Edited by D. H. Moutray Read, F.R.H.S. Pp. xii+315. (London: Philip Allan & Co., Ltd. Price 7*s.* 6*d.* net.)

Much interesting and informative matter will be found in this annual, the current issue of which contains contributions by writers whose names are well known in horticultural circles. Among these may be mentioned articles on "The Meconopsis," by Andrew Harley, "Town Garden Plants," by Lady Seton, "The Importance of Allotments," by Mr. Arthur Webb, "Hardy Ferns," by Dr. F. W. Stansfield, "Gardens of Ancient Greece and Rome," by A. MacLehose, and "New Plants of 1930," by T. Hay. Other papers deal with chrysanthemums, budding and grafting, paths and pavements, pests and remedies. In a section devoted to "Garden Enemies," attention is drawn to the depredations of the grey squirrel, which formed the subject of an article in the February, 1931, issue of this *Journal*. Reports from experimental stations; notes on the botanic expeditions of 1930-31; calendars for the garden, for pruning ornamental trees, shrubs and climbers, for vegetable sowing and planting, for fruit and irises; with

handy tables, lists of institutions, colleges, schools, societies, botanical gardens, and recent publications, combine to make this a useful manual of reference for all who are interested in the garden.

"The Feathered World" Year Book, 1931. Pp. 519. (London: *The Feathered World*, 9 Arundel Street, W.C.2. Price 2*s*.)

With the present issue, this well-known annual completes its twentieth year. Its contents cover a wide range of interest, the subjects discussed including latest methods of keeping hens intensively, commencing an egg farm, housing, ventilation, drainage, chick-rearing, feeding, and Mendelism applied to sex-linkage, while fruit growing, colour breeding in budgerigars, ornamental waterfowl, pheasant farming and fancy pigeons also receive attention.

Mr. S. H. Lewer, reviewing "The Year that has Passed," makes special reference to the Agricultural Marketing Bill, and the World's Poultry Congress. The contributors include many of the leading specialists in the poultry world. In addition to lists of county poultry instructors, laying tests and specialist clubs, and other useful data, there are over 150 illustrations.

Bee Keeping, New and Old. Vol. I. By W. Herrod-Hempsall, F.E.S. Pp. 772. 708 Illustrations. (London: *The British Bee Journal*. Price 30*s*.)

The author of this book has been well known for many years as a writer, lecturer and judge at agricultural shows, and is now Technical Adviser in Bee-keeping to the Ministry. During his long and active career, he has collected much valuable information concerning all branches of apiculture with a view to the publication of a compendious work on the subject. This first volume under notice contains chapters on the natural history of the honey bee; its home in nature and under domestication; the manufacture and uses of comb foundation; the manipulation of bees in a movable comb hive; the hiving and treatment of natural swarms and casts; the situation and arrangement of the apiary; the growth of the brood nest and establishment of colonies; procuring surplus honey; production of heather honey; queen rearing and introduction; artificial increase; uniting; spring stimulation, dwindling and cleaning; and driving and transferring bees. The text information is assisted by copious figures and illustrations.

The Journal of the National Institute of Agricultural Botany. Vol. II, No. 4. (Cambridge: W. Heffer & Sons, Ltd. Price 2*s*. 6*d*.)

The current issue of this Journal contains an account of the methods employed by the Institute in variety trials, followed by details concerning trials of sugar beet, swedes and mangolds. It is claimed that "the conclusions which have been drawn from the trials have been most satisfactorily confirmed by the crucial test of commercial farming." The Twelfth Annual Report of the Official Seed-Testing Station for England and Wales and the Minutes of the Ninth Annual General Meeting conclude an interesting number.

Tin Plate Decoration and the Lacquering of Food Containers. By A. Ll. Matthison. Pp. 156. (Birmingham: Published by the Author at Adderley Works, Bordesley Green. Price 12*s*. 6*d*.)

Canned fruit is gradually vindicating the claim that canned products represent the perfect form of prepared food. Freshness, grading, methods of cooking that ensure sterilization, but prevent the elimination of valuable constituents like salts and vitamins, are retained by good canning methods, which ensure results that cannot be surpassed in domestic cuisine. The wholesomeness of efficiently canned foods can be impaired, however, by chemical action between the sterilized food and the container, hence the production of

containers incapable of setting up chemical action with the contents is a matter of vital importance to the whole industry. Mr. Matthison, in this volume, makes available the results of a vast amount of research on the subject. He insists that the efficient preservation of processed foods depends upon efficiency at every stage of the production of the finished container. Directions in which improvements may be made are in the production of the tin plate, the application and stoving of varnish and in the can making; and Mr. Matthison's suggestions are supported by many full-page micro- and colour-photographs. Reference is also made to recent advances in lacquers (*e.g.* sulphur-resisting) which indicate that the lacquer makers are alive to the situation. It is to be hoped that Mr. Matthison's frank criticisms will have their due effect in stimulating other branches of the industry, for those engaged in it cannot fail to find much that is instructive and interesting from this well-produced volume.

The Corrosion of the Tin Plate Container by Food Products. By T. N. Morris, M.A., Dip.Ag., and J. M. Bryan, B.Sc., Dept. of Scientific and Industrial Research: Food Investigation Report No. 40. Pp. viii + 85. (London: H.M. Stationery Office. Price 1*s.* 6*d.* net.)

The first report concerning the canning problem investigations of the Low Temperature Research Station from the Food Investigation Board forms No. 40 in the now well-known series of Special Reports. It deals with fundamental problems concerning the internal corrosion of tin plate food containers. The future may produce a perfect container incapable of corrosion, but as it is probable that tin plate, with or without lacquer cover, will hold the field for a long time, it is highly desirable that the very complex reactions that may take place between the container and the canned food should receive the research attention that they deserve.

This first report is probably too highly technical to be readily grasped by directional or managerial staffs, but must be welcomed as a notable contribution to the solution of the problems of chemists interested in the canning industry. It should be mentioned, however, that paragraphs headed "Practical Implications" at the ends of some chapters epitomize the preceding experiments in "popular" language. Some 80 pages of letterpress with 18 graphs and illustrations describe a large number of experiments, and work elsewhere is reviewed.

Points of special interest with immediate practical implications are as follows. It is shown that the methods of production of the iron base influence the rate of corrosion, and that the presence of a very thin film of iron oxide brings iron into a "passive" condition towards acids. Tin in the absence of oxygen is not readily attacked by non-oxidizing acids (hence one reason for an efficient exhaust process); this resistance of tin to corrosion is, however, weakened by the presence of iron or ferric salts and unfortunately tin plate as at present produced almost ensures conditions under which the natural resistance of tin to non-oxidizing acids must be reduced.

The report indicates that work has been started upon the somewhat complex problem of the inhibition and acceleration of corrosion. Generally speaking, beet sugars appear to inhibit corrosion to a certain extent, whereas commercial grades of cane sugars appear to act as accelerators. The substance in beet sugar responsible for the inhibition has not been isolated. Sulphur or sulphides which act as accelerators if acidity is high may be beneficial when acidity is low. With products that develop sulphide-sulphur, blackening does not occur unless the reaction is on the acid side of *p*H 6·5. Experiments have shown that the addition of 0·3 to 0·5 per cent. of citric acid to low acid fruits effects a very considerable reduction in hydrogen swells. The report draws

attention to the fact that, from several points of view, steam blanching for solid pack apples is distinctly preferable to soaking. An appendix gives detailed laboratory directions for factory control of fruit packs. Of practical value too, will be the bibliography which concludes this useful contribution to the elucidation of problems connected with an increasingly important industry.

The Principles of Plant Biochemistry : Part XXI. By Muriel Wheldale Onslow, M.A. Pp. 326. (Cambridge : The University Press. London : Cambridge University Press, 1931. Price 16*s.* net.)

It is axiomatic to state that animals are dependent for their existence on the reactions which go on in the vegetable world. The plant is the sole elaborator of the food of animals. It alone is able to build up from simple inorganic substances, such as are found in the air and in the soil, the complex organic compounds that comprise the essential constituents of feeding stuffs. In these organic substances is stored up the energy that the plant derives from the sun, and when a plant or plant product is consumed by an animal, it is this energy that becomes available, in part, for maintenance and production purposes. It is scarcely an exaggeration, therefore, to assert that the two most important and fundamental reactions in nature are those by which the plant elaborates protein from the nitrate of the soil and carbohydrate from the carbon dioxide of the air. Yet these reactions, so essential to the continuance of all the races of animals, are only imperfectly understood, despite the years of patient research that the scientist has devoted to their elucidation.

In the admirable volume under review, the author traces in detail the progress of research into these and kindred problems. The chemical reader is enabled to grasp the present state of knowledge of these obscure and difficult questions, while the research worker, interested in their elucidation, is placed in a position to judge at what points further attacks on the problems may be attempted with greatest hopes of success. The general theme of the textbook, which is divided into six comprehensive sections, is a detailed study of the biochemistry of the sugars and the nitrogen compounds, the former when they take part in cell-wall formation and in plant respiration, the latter chiefly in connexion with the synthesis and breakdown of protein. One section of the book is devoted to a consideration of the oxidizing systems of higher plants, a subject on which the author herself has carried out many important researches.

It should be pointed out that the volume is intended primarily for students of plant biochemistry and beginners in research, a purpose for which it is eminently suited. It cannot be recommended to the general farmer or non-scientific reader, since the subject matter is of a highly technical character and requires a sound biochemical training for its proper appreciation. Nevertheless, research in these obscure domains is essential, in the highest degree, to a complete understanding of all the conditions that govern crop growth.

The Relationship between the Experimental and the Demonstration Plot and their Relative Value to the Investigator, the County Officer and the Fruit Grower. By T. N. Hoblyn (East Malling Research Station, East Malling, Kent. Price 3*d.*, post free 4*d.*)

This brochure, which is a reprint from the Report of the East Malling Research Station for 1929, contains a valuable exposition of the statistical method as applied to agricultural experiments. The subject has been discussed in this JOURNAL from time to time, notably in an article on "The Theory of Experimental Error," by F. L. Engledow, which appeared in the issue for July, 1925, and in one by Dr. R. A.

Fisher on "The Arrangement of Field Experiments," published in September, 1926. In the present instance, fruit is selected as offering the least complication of any medium likely to be submitted for trial by agriculturists, and by means of a few simple examples the author explains the reasons for the procedure regarded by mathematicians as essential for establishing definite conclusions. Incidentally, attention is drawn to the value of the demonstration plot for trying out results of experiments in the light of local conditions. The bulletin is written in a clear and lucid style and should be read and studied by research workers and instructors.

A Text Book of Agricultural Entomology. By Kenneth M. Smith, D.Sc., Ph.D. Pp. xiii + 285. Illustrated. (Cambridge: The University Press. 1931. Price 12*s.* 6*d.* net.)

In this small book, the author gives a somewhat detailed account of all the important insect pests of agricultural crops and farm stock in Great Britain. Three introductory chapters deal with the organization of agricultural entomology in England and Wales, the general methods of insect control, and the effect of weather conditions on insect outbreaks. In chapter II, there is a short section on legislative control, and it is perhaps worth mentioning here that the references to the large larch sawfly, the nun moth, and the narcissus fly are liable to the interpretation that the occurrence of these insects is compulsorily notifiable under the Destructive Insects and Pests Acts. This is not so; the three insects mentioned were at one time included as "scheduled pests," but were removed from the list many years ago.

The main part of the book consists of the discussion of the individual pests of farm crops, classified under the various orders of insects to which they belong. Adequate descriptions are given of the adult insects and their immature stages, followed by accounts of the life-histories, with notes on the parasites and other natural enemies and on the host plants, both wild and cultivated; finally, such control measures as appear to be practicable are outlined. There are many excellent illustrations, and each chapter closes with a considerable list of references to literature bearing on the subjects considered. Dr. Smith has spared no pains in collecting the latest information from widely scattered sources, and his accounts of the numerous pests appear to be full and accurate.

In the last chapter, the part played by insects in the dissemination of virus diseases of certain crops is discussed. This is a field of work in which the author is himself taking a leading part, and his summary of the conclusions so far reached on this important subject is of much interest.

In addition, there are two appendices. The first gives in tabular form lists of the chief crops, of the insects which attack them, and of the characteristic features of the injury inflicted; the second is a list of common farm weeds with the insect pests for which they may serve as hosts. The book is also fully indexed.

This brief account of the contents of Dr. Kenneth Smith's volume will indicate that a wide field is covered in less than 300 pages. It should be added, however, that the author has limited himself to a strictly correct interpretation of the title "agricultural entomology." Insect pests of fruit and most horticultural crops and of stored grains are not included; and only true insects are dealt with, no mention being made of pests belonging to other groups such as the Mollusca, Nematoda, or Arachnida, which, for convenience, are often held to come within the province of the economic entomologist. The book will be of great interest and value to students of entomology.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

University of Oxford, Agricultural Economics Research Institute.—Progress in English Farming Systems, IV. Another Departure in Plough Farming, by *C. S. Orwin*. (16 pp.) Oxford: at the Clarendon Press; London: Humphrey Milford, 1930. 1s. [63.191; 63.192.]

University of Oxford. Agricultural Economics Research Institute.—Progress in English Farming Systems, V. A Pioneer of Progress in Farm Management, by *C. S. Orwin*. (36 pp.+4 plates.) Oxford: at the Clarendon Press; London: Humphrey Milford, 1931. 1s. 6d. [63 (42); 63.191; 63.711.]

McConnell, Primrose.—Note-Book of Agricultural Facts and Figures for Farmers and Farm Students. (11th edition, thoroughly revised.) (540 + xi pp.) London: Crosby Lockwood, 1930. 15s. [63 (03).]

Gardiner, R. Strachan.—The Agricultural Landowner's Handbook on Taxes, Rates, Tithe Rentcharge and the Death Duties (England and Wales). (192 pp.) 3rd edition, revised and enlarged. London: Central Landowners' Association, 1930. 5s. [336.22; 348.]

Googe, Barnaby.—The Whole Art and Trade of Husbandry contained in Foure Bookes. (184 pp.) London, 1614. [63 (022).]

Bradley, R.—A Survey of the Ancient Husbandry and Gardening, collected from Cato, Varro, Columella, Virgil, and others the most eminent Writers among the Greeks and Romans. (373 pp.) London: 1725. [63.5.]

Aereboe, F., Hansen, J., and *Roemer, Th.* (herausgegeben).—Handbuch der Landwirtschaft in fünf Bänden.

Band I: Wirtschaftslehre des Landbaues (xv + 883 pp.).
Band II: Ackerbaulehre (xvi + 564 pp. + 4 pl.).
Band III: Pflanzenbaulehre und Landmaschinen (xv + 737 pp. + 12 pl.).
Band IV: Allgemeine Tierzuchtlehre (xv + 438 pp.).
Band V: Besondere Tierzuchtlehre (xiii + 513 pp.).

Berlin: Paul Parey, 1929 and 1930. 182 Rm. [63 (43); 63 (021).]

XIVème Congrès International d'Agriculture.—Bucarest, 7, 8 et 10 Juin, 1929. Actes. Vol. I: Programmes, Règlement, Publications (ix + 518 pp.). Vol. II: Rapports Principaux et Rapports, Sections 1, 2, 3 (viii + 716 pp.). Vol. III: Rapports Principaux et Rapports, Sections 4 et 5 (viii + 878 pp.). Vol. IV: Rapports Principaux et Rapports, Sections 6 et 7. Rapport Hors-Section et Communications (x + 770 pp.). Bucarest: 1930. [63 (063).]

Imperial Bureau of Soil Science.—Technical Communication No. 17:—Proceedings of a Conference on Soil Science Problems held at the Rothamsted Experimental Station, September 16-18, 1930 (44 pp.). London: H.M. Stationery Office, 1931. 1s. 6d. [63.1; 63.111.]

Moelwyn-Hughes, Ronw.—Cheap Bread (viii + 76 pp.). 2nd impression. London: Benn, 1930. 2s. 6d. [338.9; 63.311: 31; 63.311: 38.]

Institut International d'Agriculture.—Dépenses Publiques Destinées à l'Agriculture dans Différents Pays pour les Années 1913-1914, 1921-1922 et 1927-1928. Rome: 1930. [336; 35.]

Holderfleiss, P.—Agrarmeteorologie. Die Abhängigkeiten der Ernteerträge von Wetter und Klima. (vii + 107 pp.) Berlin: Paul Parey, 1930. 7 Rm. [551.5.]

Scotland, Department of Health.—Milk Consumption and the Growth of School Children. Report on an Investigation in Lanarkshire Schools by *G. Leighton* and *P. L. McKinlay*. (20 pp.) Edinburgh: H.M. Stationery Office, 1930. 3d. [612.39; 63.712; 543.2.]

Harper, F. H.—Elements of Practical Statistics. (xix + 324 pp.) New York and London: Macmillan, 1930. 10s. 6d. [311.]

Institut International d'Agriculture.—Aspects et Problèmes de l'Agriculture Exposés par les Ministres de l'Agriculture en Charge de 40 Pays. [XXVème Anniversaire de la Fondation de l'Institut International d'Agriculture.] (166 pp.) Rome: 1930. [63; 63 (0611).]

Institut International d'Agriculture.—L'Hygiène Rurale au Danemark et aux Pays-Bas. (a) Les Habitations Rurales; (b) La Mortalité dans les Campagnes; (c) Le Lait. (39 pp.) Rome: Bestetti & Tumminelli, 1930. [331; 613; 614; 614.32.]

Institut International d'Agriculture.—L'Organisation Publique et Libre de l'Agriculture dans les Divers Pays. Vol. I (208 pp.). Rome: Bestetti & Tumminelli, 1930. [35.]

International Institute of Agriculture.—The Agrarian Reform. I. Austria-Finland-Latvia-Lithuania-Poland. (106 pp.) Rome: Bestetti & Tumminelli, 1930. [333.5 (4).]

Fagg, C. C., and *Hutchings, G. E.*—An Introduction to Regional Surveying. (xi + 150 pp.) London: Cambridge University Press, 1930. 7s. 6d. [52; 55.]

Matthison, A. Ll.—Tin-Plate Decoration and the Lacquering of Food Containers. (156 pp. + 56 plates) Published by the author at Adderley Works, Bordesley Green, Birmingham, 1931. 12s. 6d. [664.8; 668.]

Department of Scientific and Industrial Research.—Food Investigation Special Report No. 40.—The Corrosion of the Tin Plate Container by Food Products. (viii + 85 pp.) London: H.M. Stationery Office, 1931, 1s. 6d. [664.8.]

Food Industries Manual.—A Technical and Commercial Compendium on the Manufacture, Preserving, Packing and Storage of all Food Products (Editor: *H. B. Cronshaw*). (399 pp.) London: L. Hill, Ltd., 231 Strand, 1931. [664; 664.8.]

Hopkins, R. Thurston.—Old Watermills and Windmills. (ix + 245 pp. + 26 plates) London: Philip Allan, 1930, 16s. [63 (08); 63.17 (02); 664.6.]

The Institute of Public Affairs, University of Virginia.—The Country Life of the Nation. Editor: *Wilson Gee*. (xv + 214 pp.) The University of North Carolina Press, Chapel Hill, 1930. 9s. [30; 331 (73); 63 (73).]

Hurry, J. B.—The Woad Plant and Its Dye. (xxv + 328 pp. + xvii plates.) Oxford: University Press; London: Humphrey Milford, 1930. 21s. [63.342; 63.348.]

Agricultural Economics

South-Eastern Agricultural College, Wye.—Department of Economics, Report No. X. Investigation into Farming Costs of Production and Financial Results. Sheep Breeding and Feeding over Six Years, by *J. Wyllie*. (pp. 313-346.) Wye: 1930. 1s. [338.1 (42); 338.58; 63.631 (04); 63.631: 043.]

South-Eastern Agricultural College, Wye.—Department of Economics, Report No. XI:—Financial Results on the College Farms. I: Sheep Breeding and Feeding over Four Years,

1926-27 to 1929-30, by *J. Wyllie* and *N. V. Hewison*. (pp. 1-36.) Wye: 1931. 2s. [338 1(42); 63.631 (04); 63.631 : 043.]

Orwin, C. S.—The Future of Farming. (156 pp.) Oxford: at the Clarendon Press; London: Humphrey Milford, 1930. 5s. [338.1 (42); 63 (42); 63 (022); 63.191.]

Brereton, C.—The Agricultural Crisis and the Way Out. (47 pp.) Obtainable from Messrs. Jarrold & Sons, Ltd., London Street, Norwich, 1930. 3d. [338.1 (42).]

Thomas, Sir Wm. Beach.—Why the Land Dies. (32 pp.) London: Faber & Faber, 1931, 1s. [338.1 (42).]

The National Council for Industry and Commerce.—The Case for Agriculture. (12 pp.) London, 1931, 6d. [338.1 (42).]

International Institute of Agriculture.—The Agricultural Situation in 1929–30 (Markets and Prices—Action taken by Governments and by Voluntary Organisations—Economic Conditions of the Farmers). Economic Commentary on the International Year Book of Agricultural Statistics for 1929–30. (174 pp.) Rome: Bestetti and Tumminelli, 1931. 20 lire. [338.1; 35.]

International Institute of Agriculture.—Index-Numbers of Prices of Agricultural Products and other Price-Indices of Interest to the Farmer (Methodological Data and Tables). (122 pp.) Rome: Bestetti and Tumminelli, 1930. [338.5.]

Institut International d'Agriculture.—Recueil de Statistiques Basées sur les Données de la Comptabilité Agricole pour 1927–28. (xix+319 pp.) Rome: Bestetti and Tumminelli, 1930. [31; 338.1]

Markets and Marketing

Maughan, C.—Markets of London. (x+208 pp.) London: Pitman, 1931. 6s. [381.1.]

Ministry of Agriculture and Fisheries.—Economic Series No. 22: Report on the Marketing of Dairy Produce in England and Wales. Part I: Cheese. (xi+153 pp.+29 pl.) London: H.M. Stationery Office, 1930. 6d. [63.733.]

Ministry of Agriculture and Fisheries.—Economic Series No. 24: Report on the Preparation of Fruit for Market. Part II: Gooseberries, Currants, Cherries, Raspberries, Loganberries, Tomatoes, Cucumbers and Grapes. (xvi+100 pp.+34 pl.) London: H.M. Stationery Office, 1931. 6d. [63.41 : 38.]

Ministry of Agriculture and Fisheries and Scottish Office.—Report of an Inter-Departmental Committee on the Grading and Marking of Beef. (49 pp.) [Cmd. 3648.] London: H.M. Stationery Office, 1930. 9d. [63.75.]

Street, A. W.—Publicity as a Factor in Agricultural Marketing. (Notes of an Address given to the Publicity Club of London, Jan. 19, 1931.) (14 pp.) London: The Publicity Club, 1931. [381; 659.]

Abrams, M. A.—Avoncroft Rural Studies I:—Marketing of Fruit and Vegetables. (60 pp.+4 pl.) Offenham: Avoncroft College for Rural Workers, 1931. 1s. [63.41 : 38; 63.51 : 38.]

Du Plessis, A. F.—The Marketing of Wool. (xiii+337 pp.) London: Pitman, 1931. 12s. 6d. [63.761.]

Empire Marketing Board.—E.M.B. 34: The Demand for Empire Butter. Report of an Investigation by the Economic Section of the Empire Marketing Board into the Retail Marketing of Butter in the United Kingdom. (55 pp.) London: H.M. Stationery Office, 1930. 1s. [63.724.]

Irish Free State.—Interim Report of the Tribunal to Inquire into the Marketing of Butter. (15 pp.) Dublin: Stationery Office. 1931. 2d. [63.724.]

The Register is priced 6*d.*, and can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. A copy of the Volume is issued free to all members of Milk Recording Societies.

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"BLIGHT" is the most serious of all the various diseases of the potato. It attacks the foliage and also causes the tubers to rot. It occurs every season, but its spread and intensity depend largely on weather conditions. These, unfortunately, cannot be determined with certainty in advance; and those growers are wise, therefore, who prepare to wage war against potato Blight, by spraying, as soon as they learn that the disease has made its appearance once more.

Potato Blight

The first occurrence of potato Blight on this season's crop was noted as early as May 12, when the disease was observed on the Gulval Experiment Station, near Penzance. On May 28, it was found at Mousehole, also near that town. It may now be expected to appear, sooner or later, in other districts, not necessarily confined to the West of England. For, although the earliest outbreaks generally occur in western counties, yet the records of several years past show that Blight does not spread as an epidemic wave from the west, but often breaks out more or less simultaneously in widely-separated localities.* If any reader needs information about the disease, he should study the particulars concerning potato Blight and the means of controlling it, which will be found in Leaflet No. 23, to be obtained, post free, from the Ministry, 10, Whitehall Place, London, S.W.1.

* * * * * *

ON June 2 Sir William Waterlow, Chairman of the Central Allotments Committee, entertained to lunch the District Organizers associated with the scheme for providing seeds, tools and fertilizers for unemployed allotment holders. Dr. Addison, the Minister of Agriculture, who was present, paid a warm tribute to the inspiring leadership of Sir William in the carrying out of that part of the Agricultural Land (Utilization) Bill which had received the support of all political parties. Thanks to their good-will the necessary money was voted by the House of Commons in advance of

Allotments for the Unemployed

* Since this note was written, potato Blight has been reported in Devonshire and in Lincolnshire.

the passage of the Bill, to enable the Central Allotments Committee to proceed this spring with the provision of seeds, tools and fertilizers. Sir William's Committee, with the voluntary help of the District Organizers, had done yeoman service in organizing the work and distributing the materials.

The late start, which was, of course, unavoidable, was a considerable handicap, but it says much for the work of organizers when it is realized that the scheme was working well within six weeks of its establishment. Organizers had a great deal to do. Not only had they to arrange the details of the scheme in the various areas, but they had, in many cases, to persuade local authorities to provide land. In many instances also they had to form men into associations. 1,600 tons of seed potatoes, 1,100 tons of fertilizers, 1,400 tons of lime, 46,500 spades and forks, and over 1,000,000 packets of seeds had been supplied. In all, Dr. Addison said, 64,000 men had received assistance, a result which was a wonderful tribute to the energy and enthusiasm of Sir William and his voluntary workers.

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New Fishery Research Vessel

ON Monday, June 1, at 12.15 p.m. the survey ship H.M.S. "Challenger" which is being built by the Admiralty for the Ministry of Agriculture and Fisheries was floated out of dock at Chatham. The ceremony was performed by Miss Addison, daughter of the Minister of Agriculture and Fisheries.

The construction of this ship is the outcome of an Interim Report of the Fisheries Committee of the Economic Advisory Council, which recommended that His Majesty's Government should undertake an organized search for new fishing grounds.

The ship, which has been specially constructed for exploratory work in northern waters, is an oil-burning vessel. She is 220 ft. in overall length, and has a displacement of 1,400 tons and a sea endurance of 9,500 miles. The vessel will be manned and run by the Admiralty, but will carry two scientific officers and a fishing skipper appointed by the Ministry.

The Hydrographic Department of the Admiralty will undertake the survey work, and it is hoped that important new fishing grounds will be discovered and charted.

The name "Challenger" has very appropriately been chosen for the ship, to perpetuate the memory and the traditions of the famous voyage of H.M.S. "Challenger" in the years 1872-1876. That voyage is justly regarded as having laid

the foundations of scientific research at sea. Although the new ship is not expected or intended to carry out, like her famous predecessor, a circumnavigation of the world, anyhow at present, and her immediate objective may make less appeal to the imagination, she starts with up-to-date equipment for scientific research, and may be counted on to maintain the high traditions associated with her name.

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Some Diseases of Rabbits

RABBITS are kept by many people in all parts of the country and it follows that the health of rabbits must be a subject of wide interest. The maintenance of good health is largely a matter of avoidance of disease, and this is best attained by a knowledge of the causes of ailments and of the principles of hygiene. The Ministry has just published a short Bulletin* that deals in a simple and practical manner with the most important diseases affecting rabbits, and it is hoped that the publication will find its way to large numbers of rabbit-keepers.

The advice given is up-to-date and authoritative, and, while methods of treatment for various disorders are recommended, it is stressed that disease should be avoided by means of clean housing, proper feeding and attention and, where necessary, the stamping out of trouble at its first appearance.

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The Ministry's Publications

A NOTE on the transfer of the publication of the Ministry's Leaflets and Bulletins to H.M. Stationery Office was published in the April, 1931, issue of this JOURNAL, p. 9. It is now possible to give further details.

All publications can now be purchased directly from H.M. Stationery Office at the following addresses : Adastral House, Kingsway, London, W.C.2 ; 120, George Street, Edinburgh ; York Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ; 15, Donegall Square West, Belfast ; or through any bookseller.

Postal applications for Bulletins should be addressed to the nearest branch of the Stationery Office, the necessary addition for postage being included in the remittance.

Publications will also continue to be on sale *to personal applicants* at the Ministry's Office at 10, Whitehall Place,

* Bulletin No. 14, *Some Diseases of Rabbits*, price 3*d*., obtainable through any bookseller or, post free, 4*d*., direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

London, S.W.1, and applications by post for *free leaflets* should also be sent to that address. The number of leaflets supplied free will be restricted to 4 in any one group, with a maximum of 20 in all. Additional copies required may be purchased from H.M. Stationery Office at any of the above addresses, price 1d. each, or 9d. per dozen, postage extra in each case.

Leaflets required by Schools and other educational institutions, Allotment Societies and Farmers Clubs, may be supplied at the reduced rate of 2s. per 100, postage extra. Application should be made to H.M. Stationery Office at the London address.

A selected list of the Ministry's publications on agriculture, showing the prices, the additions for postage, and the leaflet "groups," can be obtained free and post free on application to the Ministry, or to the Stationery Office at any of the addresses mentioned.

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Ormskirk Potato Trials, 1931

THE National Institute of Agricultural Botany wishes to extend an invitation to farmers, potato growers and merchants, and agricultural advisory and administrative officers to visit the Potato Testing Station, Ormskirk, singly or in parties on August 12, 1931, or, if this date is inconvenient, on any weekday between August 4 and 15, 1931. Besides the usual trials of new varieties of potatoes for immunity from wart disease, the Institute is continuing, for the Ministry of Agriculture and Fisheries, field investigations of virus disease, and of the possibility of growing in England seed potatoes free from virus diseases. These trials may be inspected by visitors, who will also be able to see the Lord Derby Gold Medal Trials, of which there are two this year, and Yield and Maturity Trials, on two different systems, of the leading main crop potatoes. Some of these trials are designed to show the influence of origin of seed on the behaviour of varieties. There are also many demonstration plots of British and foreign varieties of potatoes, including those certified as immune in 1928 and 1929, and an interesting series of plots relating to common potato synonyms.

Secretaries of branches of the National Farmers' Union and others who wish to organize parties to see the trials should write to the Superintendent of Potato Trials, Potato Testing Station, Lathom, Ormskirk, Lancs., suggesting alternative dates. Individual visitors will be equally welcome, but they, too, should inform the Superintendent of the date of their

visit not less than a week in advance. Ormskirk is conveniently reached by a frequent service of local trains from either Liverpool or Preston.

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Organic Manure for Allotments

THOUGH the value of waste vegetable matter as a potential manure is well established, it is not infrequently regarded as pure waste and so burnt, or otherwise profitlessly disposed of. Cultivators of allotments are not always aware that garden refuse such as leaves, straw, stalks, grass cuttings, etc., may, by a suitable process of rotting, be converted into a rich organic manure. The use of the preparation known as "Adco"* offers an easy means of treating reasonably large quantities of such waste material in a way that secures full benefit in manurial quality. The method recommended consists in stacking and wetting the material layer by layer and mixing it with the Adco preparation, usually in the proportion of 1 to 1½ of Adco to 20 of refuse by weight.

A hard, level piece of ground, sheltered as far as possible from the wind, with a plentiful supply of water (delivered by hose, if possible), should be selected for the operation. A proportion of the material—about one-sixth—should be spread upon the ground in a square layer about 1 foot in thickness, and well trodden down, any stalks having previously been cut or broken into small pieces. It should be sprayed intermittently with water—using a rose or similar nozzle—until the layer is thoroughly soaked. One-sixth of the whole amount of Adco required should then be applied as uniformly as possible over the mass. A further layer of the refuse should then be added, and trampled down as before, thoroughly wetted, and sprinkled with the same quantity of Adco. The operation should be repeated. The last application of Adco should be covered with a layer of the material merely a few inches in thickness; and this should be wetted as before.

In order to allow of uniform wetting, the heap ought not to exceed 6 ft. in height; it should have a flat level top to prevent water running off. If any considerable proportion, say one-third, should get dry, the whole stack should be turned over, wetting it where necessary. During the first three weeks, however, the stack should not be disturbed. The material

* It should be mentioned that Adco is a preparation that has been manufactured as the result of research work conducted at the Rothamsted Experimental Station.

should be ready for use in several months' time, when well rotted.

Adco may be obtained in reasonably small quantities from corn and seed merchants, or direct from the manufacturers, Messrs. Adco Ltd., 78, High Street, Harpenden, Herts.

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THE following note has been communicated by Colonel A. B. Minchin, C.I.E., C.B.E. :—

The British Angora Rabbit Industry

Whilst the Angora wool industry has been established for a considerable period in France, it has only taken root in the British Isles within the past decade. As a show rabbit, the Angora has found favour with English fanciers for at least half a century, but in France it has been bred only on commercial lines. The result is that the English Angora rabbit is far superior to the French variety as regards the texture and staple of its wool, which is thus specially suited to the manufacture of garments of all kinds. On the other hand, the French rabbit wool is considered by most spinners to be the only material suitable for the production of the coarse, fluffy yarn which forms the great bulk of the trade throughout the world.

The first record to be found of the sale of Angora wool by British producers occurs in 1922. In 1925, the sale was about 2,000 lb. and the output increased to nearly 16,000 lb. in 1927. All this wool was utilized for the garment trade. In 1927 there was a boom in Angora wool garments, but this was followed by a slump in British-produced wool which lasted till 1930. During the years 1928 and 1929, however, when British Angora wool could not be sold at any price, Angora wool was being imported from the Continent in enormous quantities and utilized for the spinning of the coarse, fluffy yarn that is always in demand for embroidery purposes and for the manufacture of berets, children's clothing, etc. It will thus be seen that in the past the demand for the British produce has depended on the dictates of fashion, whilst the French variety has been much less subject to such vicissitudes. Even in 1930, the big demand for British Angora wool was largely due to the failure of Continental producers to meet the world's requirements.

In 1928, the writer's firm commenced buying Angora wool in order to help British producers, many of whom were in great trouble owing to the failure of their market. The fact

that the great majority of wool-growers consisted of ex-service men, pensioners, invalids, small-holders and others, whose entire resources had been invested in their rabbitries, made their position very precarious. Begun in a spirit of philanthropy, the undertaking has gradually grown into a big commercial concern, but the original aim of establishing the British industry on a sound and enduring basis has always been kept in view. With this object, we adopted from the commencement a scale of gradings and prices which, as practical Angora breeders, we knew to be remunerative to the producers, and insisted always on buying at these rates, although, throughout the slump, large quantities of wool were constantly being offered at breakdown prices. It was felt that the only way to save the industry from disruption was to show confidence in the future by buying month by month from the worst sufferers, at a fair commercial price, as much wool as means would allow. Many breeders have since stated that, had it not been for the confidence thus inspired, there would have been no industry left when the market reopened in 1930. As it was, some 3,000 Angora rabbit breeders were brought through the two-years slump, and the number of suppliers has since increased to over 5,000.

First efforts were directed to the production of high-class yarns for garment-production, and after costly experiments it was possible to evolve yarns that do not shed, and that combine in high degree the essential qualities of warmth, lightness and softness with reasonable price. Garments made from these yarns are sold under a registered trade-name and have gained a high reputation for beauty and hard-wearing qualities throughout the world. One of the most important characteristics of Angora wool is its dielectric properties. For instance a suit of Angora wool underclothes in wear acts as an insulator, preventing the electrical energies of the wearer's body from becoming dissipated. This unique property makes the wool invaluable to sufferers from rheumatism and debility, and to all who have to husband their bodily resources. Both underwear and overwear also form a great safeguard against chills, for whilst retaining the warmth of the body, the fabric will not allow cold to penetrate from the outside. It is very desirable that the therapeutic properties of Angora wool should become widely known, and we are glad to have been able to interest an increasing number of medical authorities in the suitability of British Angora wool, as being the softest, lightest and warmest material in the world, to the special requirements of

patients and invalids. When it is realized that a thin Angora wool pullover, weighing a few ounces, gives as much warmth as a heavy garment of sheep's wool, the value of British Angora wool for sports wear and general use in the country is self-evident. In the past, the British product has been at the mercy of fashion, but once its particular qualities are known, universal popularity should be assured.

The most recent and important achievement has been to produce from British Angora wool a first-class embroidery yarn of the coarse, fluffy type for which other spinners have considered the French grade essential. This opens up for the British wool a wide outlet that has not hitherto been available, and should enable the industry to stabilize the British position and secure a firm market for its products.

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Reports of Agricultural Research Institutes, 1929-30

THE Ministry has just issued a volume entitled *Reports on the Work of Agricultural Research Institutes and on Certain Other Agricultural Investigations in the United Kingdom*, 1929-30, the aim of which is to present in a convenient form the progress of agricultural research carried out with the aid of State funds during the academic year October 1, 1929, to September 30, 1930. The volume is planned on the same lines as its predecessor, the volume covering the academic year 1928-1929, which took the place of a Paper of the Agricultural Research Council prepared annually for the information of the Council and circulated in typescript among other persons interested. Copies of the two volumes may be obtained, free and post free, from the Ministry.

The first and by far the largest section of the Reports is devoted to summaries of the research work carried out at Agricultural Research Institutes and at certain State institutions such as the Ministry's Plant Pathological and Veterinary Laboratories. (As regards Northern Ireland, agricultural research is conducted entirely by its Ministry of Agriculture.) The section is sub-divided according to the subjects dealt with, beginning with "Soils, Plant Nutrition, and Plant Physiology," and ending with "Agricultural Engineering."

Then follows a section in which are described the local investigations carried out at Advisory Centres by the advisory officers maintained by the Ministry and the Department of Agriculture for Scotland. These reports are also grouped

by subjects, viz., chemistry, entomology, mycology, veterinary science, dairy bacteriology and economics.

In the third and last section are included a number of miscellaneous investigations of a comparatively minor character falling outside the scope of the main work of Research Institutes. An appendix contains a list of Directors of Research Institutes and Heads of Advisory and other Centres, and a subject index is added.

The volume will, it is hoped, not only be useful to the scientific worker but will also give the lay reader some idea of the varied investigations that are being carried out from year to year for the benefit of agriculture. A glance at the table of contents will show that a very comprehensive organization has been built up, and that no branch of agricultural science is neglected. A few random examples of lines of research described in the reports will suffice to indicate the wide range covered. The Animal Nutrition Institute, Cambridge University, investigates the influence of intensive grazing on the yield, composition and nutritive value of pasture herbage. The Department of Animal Pathology, also at Cambridge, investigates the effect of nematode worms on the metabolism of sheep. At Oxford the Department of Zoology studies the fluctuations in the numbers of wild rodents. The Advisory Economist at Cambridge begins an economic survey of the agriculture of Hertfordshire. These examples are given not because of their outstanding importance, but merely, as stated above, to illustrate the wide range of subjects covered in the reports.

The Paper of the Agricultural Research Council mentioned in the first paragraph above contained lists of papers published by research workers during the year. Since 1926-27, however, an annual volume has been published separately entitled *Abstracts of Papers on Agricultural Research in the United Kingdom*. Copies for each year may be obtained from the Ministry, price 1*s*. net each volume, post free.

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Basis for Redemption of Tithe Rentcharge

THE Minister of Agriculture and Fisheries announced on May 28 that, for the purpose of the redemption of tithe rentcharge, for which application is made after May 31, 1931, until further notice, the compensation for redemption will be twenty-three times the net amount of the tithe rentcharge after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

B.B.C. TALKS ON PIG-KEEPING—II*

Sir DANIEL HALL, K.C.B., LL.D., F.R.S.,
Chief Scientific Adviser, Ministry of Agriculture and Fisheries.

Feeding.—Turning now to the question of feeding, this business is divisible into three stages: the production of the sucker; the feeding of the sucker up to a dead weight of about 5 score—the porker; and the last stage, which turns out the baconer at about 8 score. It is true that there is no break between the two latter stages, but we ought to know the costs of production up to each stage, since each of the three can be marketed. The elements that enter into these costings are not numerous, the chief variable being the cost of food, so that every pig-keeper ought to be able to keep some sort of running account against his pigs, whereby he can check his working from time to time and be made aware of any waste or leakages that are going on. The management must be exact; the margin of profit in pig-keeping is too small, taking one year with another, to allow of any go-as-you-please system.

In order to illustrate the points I want to make, I propose to use the very full accounts I possess of eight years' pig-keeping on a farm running from 12 to 20 sows and selling from 120 to 250 pigs each year. The business was profitable over the whole period, but not specially so, since, after a nice herd of selected sows had been built up, there was an outbreak of disease, so that the stock had to be cleared out and a fresh start made. This break came just when the herd had grown into its best profit, but, as such accidents are incidental to pig keeping, the average results of good and bad years together pretty fairly represent what may be expected with good management.

In estimating the cost of the suckers, it is simplest to charge them with all overheads like rent and veterinary expenses. Then we have to add the cost of replacement of sows and boars, the food and labour. The cost of food is the most variable factor. In this case, the sows received an average of 4 lb. of food per day for eight months in the year, and 8 lb. a day for the other four months, and they were out on a grass run of about half an acre per sow except when they were in the sties with their young pigs, when they always had some green meat thrown to them. The standard diet varied from time

* This Broadcast talk was given on March 4 last. The first of these talks was published in the issue of this JOURNAL for June, 1931, p. 254.

to time according to the price of feeding stuffs, for the pig-keeper must always be watching the market. Typical rations were 4 lb. per day of a mixture of coconut cake and toppings, with 5 per cent. of fish meal for in-pig sows running on plenty of grass, or, again, up to 12 lb. a day of a mixture of 1 part palm kernel meal, 1 part barley meal and 2 parts toppings, again with 5 per cent. of fish meal for sows in sties with their litters. The sow's food should always be a little more nitrogenous as she gets heavy in pig. On this basis, the sows ate about 17 cwt. of the mixture a year, the boars about 14 cwt., in addition to their grazing; and the cost of the food varied, in the period concerned, 1921-1928, between 8*s.* 7*d.* and 10*s.* 5*d.* per cwt. At the present time, it would be about 5*s.* 6*d.* Labour costs can be calculated on the basis that one man will be required to look after about 40 breeding sows; similarly one man is required for about 200 feeding pigs.

Actually, on this farm, the average cost per sucker, taking all the items I have mentioned into account, amounted to 31*s.* 6*d.* This is too high a figure and was due to the attack of disease which reduced the number of suckers weaned per sow to as low as 8½, after the herd had been worked up to producing an average of 16 per sow in the previous year. It shows, however, the overwhelming importance of the prolificacy of the sows in determining this prime charge—the cost of the sucker. The varying price of feeding stuffs may shift the cost a few shillings one way or the other, but here the number weaned per farrow in different years of itself altered the cost from as low as 24*s.* to as high as 44*s.*, a difference of a pound a head, which, itself, would be a reasonable profit on each pig sold. We have to regard the cost of the sucker as so much dead charge, which has to be wiped off by the profit obtained later by the conversion of feeding stuffs into pig meat.

Having got to the sucker stage, how is the management to be continued? Some little time ago, a lot of people were in favour of an open-air life for pigs, which were to graze down pasture or fodder crops like sheep. Some enthusiasts even turned their pigs into the woods to scratch for their living upon acorns, beech mast and bracken roots, together with such small game as they could grub up from the soil. So did our rude forefathers keep their pigs; in Domesday book the amount of pannage which each tenant possessed in the forest is strictly set down—but our Saxon ancestors could not buy millers' offals, and they wanted so much barley for their ale

that they could spare none for the pig. Their one chance of getting some flesh on the pig lay in an abundant mast or acorn year. The advocates of a simple life in the woods always claimed that their pigs were healthier. Certainly they lived longer, at least those who survived the first few weeks, because it took them a long time before they were ready for the butcher. Never have I seen a more melancholy spectacle than pigs grouting about in a dripping woodland on a wet winter's day. Except in special seasons, there is no natural food for pigs in the woods. Their rations have to be carried to them at some expense of labour, and there is no return for the manure produced.

The feeding pig is a machine for converting food into meat; it should be ready for killing in five months from weaning, and if it has been properly bred and reared and kept under decent conditions no question of health arises. There should be no such thing as a store pig, an animal building up a constitution and a frame on which to put flesh later. So the root objection to outdoor pig-keeping, even for a part of the animals' lives, is the loss of time it involves in getting the pigs up to the desired weight. Loss of time means waste of food; for every day of his life the pig must use up so much food merely in running the machine without adding to his weight. This maintenance ration is wasted if, at the same time, the pig is not converting some further food into flesh and so putting on weight. A young pig of 100-200 lb. live weight will consume about 2 lb. of barley meal per day for maintenance ration alone, so that a month's delay in preparation for market means a waste of half a hundredweight of food. All the activity of an outdoor pig again means food used up in working instead of putting on weight. Further, the pig is not an animal that can turn grass and rough fodder crops to good advantage. His digestive power for such food is inferior, and a large part of the nutritive value is used up in the work of digestion. Again, it is important to realize that the capacity of the pig's stomach is limited. If you try to feed him on roots and green crops he cannot hold enough during the day to give him the quantity of real food he could utilize. It is a very interesting fact, which was brought to light in those magnificent studies of the nutrition of the pig, initiated by the late Professor T. B. Wood, that at a certain stage in his development the pig cannot eat enough even of the ordinary foods like middlings to maintain his growth rate. He wants, then, the most concentrated diet that can be

found for him, otherwise he cannot pack enough fuel into his boiler to keep going at full steam.

For this main reason, then—loss of time, and therefore waste of food—the open-air system is not to be recommended when the business is pig-feeding for meat production. The pedigree breeder may find it useful because he is very greatly concerned in getting a strong constitution in his stock and need not mind a slower growth and a somewhat greater consumption of food. Again, there are fruit growers who want to use pigs as scavengers and manure makers in their orchards, where pigs can do excellent work in reducing the attack of codling moth and similar pests that harbour in the ground for a time.

But these are special cases; for meat production, the young pig should be grown as fast as possible and need never leave the fattening sty until he goes for slaughter. The sties should be reasonably warm, easy to clean so that they can be kept dry, free from draughts, and generally dark, though it is all the better if a few hours' sun can be let in. If they are kept small, say for six pigs, it is easy to secure level feeding of the pigs. I cannot here discuss arrangements for feeding, that is a matter every man must work out for himself, with the necessity of labour-saving in view.

Now as to foods. In all nutrition, we have two things to consider—the fuel that keeps the machine running, that warms the body and then builds up the fat, and the protein that repairs tissue waste and makes flesh. For fuel, we look to carbohydrates and fats, but as the pig is a very efficient utilizer of the cheaper carbohydrates, we do not trouble much about fats in his rations. The most useful carbohydrates are millers' offals—middlings in particular—and barley meal; just lately rice meal has been specially cheap. Both milling offals and barley produce a good quality of meat. Maize should not be used in the last three or four months of the pig's life because it produces a soft, oily fat. Bulky, fibrous foods must be avoided; even bran should be reserved for the sows, for which it is helpful against constipation. When wheat is cheaper than offals, it should be ground and fed, but, like all meals for pigs, it must be ground fine. These meals, however, will not supply enough protein, of which the pig requires from one-third to two-thirds of a pound per day according to weight, with a richer ration when growing than when approaching fatness. Of the available proteins, the best is separated milk, but it is really too valuable to be spared

for such a purpose. Next I should put bean meal, but that again is expensive. Perfectly sound results can be got with coconut cake and extracted palm kernel meal up to one-quarter of the ration. The fat of either of these cakes does not make for good quality in the bacon, so it is best to buy them "extracted," and not to feed too much of them. For the same reason, linseed cake should be avoided. Fish meal is also invaluable, but it must be the best kind, made from white fish, and must never constitute more than 5 per cent. of the ration; indeed it is safest to leave it out for the last month of feeding. Nothing is gained by cooking the food.

It is always wise in feeding to make the diet as mixed as possible, not all barley meal nor all miller's offals; the constituents of the different proteins in the various feeding stuffs supplement one another in building up the animal's protein. The proportion of protein, *i.e.* of cake and fish meal, can be lowered in the later stages of fattening a bacon pig —say, after the porker weight has been passed. It is not, however, always easy to arrange for this if the pigman has a lot of pigs of different ages to feed and no time to deal with each pen individually. In the early days, the newly-weaned pigs should be very carefully fed, chiefly on fine middlings with a little pea or bean meal and some maize gluten meal, together with 2 oz. per head of fish meal or dried yeast. I cannot, here, discuss the making up of rations according to the relative cheapness of the feeding stuffs at the time available, but you will find the information in the monthly notes in the JOURNAL OF THE MINISTRY OF AGRICULTURE or in an admirable little book on animal nutrition by the late Professor Wood.

Over and above these main elements of food, all animals need small amounts of what we now call "accessories," mineral and vitamin. The fish meal supplies a good deal of what is wanted, but the pigs should have a salt lick and some chalk. The vitamin requirement will be met by a swede apiece or a little kale every day. Should the pig-keeper think his animals are not doing properly, he can often remedy some of these obscure difficulties of nutrition by an ounce or two of cod liver oil per day. It is as regards these "accessories" that separated milk is so valuable—but the pigs can hardly pay for separated milk unless it happens in some way to be a by-product of the farm. Whey is about as valuable when it is obtainable, and nowadays there is a process for condensing the whey from the cheese factories, producing "whey solids,"

an excellent adjunct to supply the "accessories" that should be added to the staple diet for pigs. I need only add that these accessories are most important when the pig is young and growing rapidly; in their absence rickets, joint weaknesses, scurvy and skin troubles are sure to occur.

* * * * * *

FARMING ON THE BORDERS OF DEVON AND CORNWALL

A. DINNIS,
Godcott, North Petherwin, Devon.

THE district under notice lies between Dartmoor and the continuation spur that extends into Cornwall. These hills are the sources of numerous small streams feeding the River Tamar, which acts as the natural boundary line between the two counties for the major portion of its course. Owing to the hilly nature of the district, and its proximity to the Atlantic, from whence the prevailing wind comes, the rainfall is considerable, averaging between 40 and 50 in. per annum, and this factor causes grassland farming and stock raising to predominate. The climate is equable, snow and hard weather rarely persisting, with the result that throughout the winter there is usually some natural keep available for sheep and also for cattle on the drier land. Very young or fattening cattle and cows in milk are usually housed, at least at night, from November until the end of March; whether they are turned out by day depends frequently on the likelihood or otherwise of the poaching of the land.

Farms are small to medium in size, the majority between 50 and 150 acres, with larger ones running from 150 to 400 acres interspersed. Fields are usually small and generally enclosed by high banks on which a living hedge grows. The soil for the most part is a clay loam, which is retentive of moisture, and thus does not burn readily in times of drought, except on some of the hilly farms. Phosphates and lime give good results on both the grass land and the arable; and basic slag, superphosphate and, more recently, mineral phosphates are in common use. Wild white clover appears to be indigenous and is much encouraged by phosphates. Since the effectiveness of manurial dressings of grass land has become apparent, there has been a considerable lowering of the age at which cattle are finished for the butcher; cattle now usually go off the

farms finished at 2 to 2½ years old, an average gain of from 6 to 9 months on former practice.

Efficient stocking of the pasture is necessary in the spring to prevent grasses running to seed, and in some seasons it is necessary to top-off rank growth in the summer with the mowing machine.

On account of the high rainfall, and the somewhat heavy character of the soil, it is unusual to find more than 20 per cent. of the land on a farm under arable cropping, and the crops grown are in the main intended for fodder to supplement the grass and hay and to reduce to a minimum the bill for purchased feeding stuffs. The crops usually grown are oats, or dredge corn (a mixture of oats and barley), mangolds, turnips, rape, temporary ley, and potatoes for local needs. Rape is grown principally to fatten lambs, and is consumed on the land to put heart into the soil before sowing the cereal crop, which acts as nurse to the temporary ley. One year ley mixtures are not frequent, the average duration being three years.

Management and Breeds of Live Stock.—Store cattle are most commonly raised on the outlying poorer farms, whilst farms on the better land concentrate more on milk production or on feeding purchased stores for beef. The South Devon breed of cattle is more favoured in the Tavistock locality, and the smaller North Devon in the Launceston-Holsworthy area. The best feeding pastures are around Tavistock, and here the heavy South Devon steers are often finished on grass alone. Sheep are found on most farms, but the flocks are larger on the farms with most arable land. Three principal local breeds are represented and each predominates in certain districts. Around Tavistock and the fringe of Dartmoor, the Dartmoor breed maintains its ground; the northern limit of the district finds the Devon Long Wool firmly entrenched, although this is gradually giving way to the Devon Close Wool. The Southern area is still largely given up to the South Devon breed. Pigs and poultry are useful side lines on most farms.

Market Facilities and Methods of Disposal.—The principal markets of the district are Tavistock and Holsworthy (Devon), and Launceston and Callington (Cornwall). Many of the fat cattle are purchased for consumption in Plymouth and the coastal towns, but some are forwarded to Exeter market where buyers from up country attend. Some South Devon cattle are

sold at Truro. Two-year-old cattle in fresh condition often pass through dealers to Midland graziers in Northampton and Leicestershire, whilst there is also a considerable trade with Sussex via Chichester. A dried-milk factory at Lifton absorbs a fair amount of liquid milk. In more recent years the production of fat lamb for the London market and, also, for the coastal towns, has considerably increased. The existence of a large farmers' co-operative slaughterhouse adjoining the railway at Holsworthy has helped to extend this trade. Many young breeding ewes are purchased outside the district for crossing purposes.

Mr. W. Harwood Long, the advisory economist attached to Seale-Hayne Agricultural College, has undertaken the costings of a number of farms in Devon and Cornwall, and the writer is owner-occupier of the farm P7 mentioned in Mr. Long's publication No. 23, "An Economic Investigation of Devon and Cornwall Farms." The figures and tables to which reference is made are extracted from that report.

This is a farm of 490 acres. Some 30 to 40 acres of corn are grown annually, about 10 acres are devoted to green crops and rape, another 10 acres are mown as seeds hay, and there are usually about 20 acres or more of meadow hay. Practically all the crops are consumed on the holding. The remaining land is in grass of which a proportion is old feeding pasture brought to a high state of fertility by years of grazing fattening cattle with the assistance of cake and corn. It is situated 5 miles from a market town or rail head, and most of the soil is of a clay type. The rent has been apportioned at 19*s.* 1*d.* per acre. Six full-time men are employed ; it is rarely necessary to employ casual help, and two teams of horses do all the work.

Fattening purchased cattle at grass is the principal object, but a certain amount of winter stall feeding is practised, usually limited to finishing off stores in forward condition at the conclusion of the grazing season. Although no fixed custom is followed, the store cattle purchased are usually rather young, but the object aimed at is to keep none on the farm for more than twelve months. As a rule some 40 cattle in forward condition are turned out to graze on the best pastures in the spring. They are tied up daily to receive a ration of concentrates, usually a mixture of cake and maize meal. About the middle of June, drafting out for market commences and, as fat cattle are cleared, they are replaced by the most forward stores. The most promising heifers are used for breeding and, as calving approaches, they are given the run over the second

best pastures to get them into good condition, with the object of selling them with "calf-at-foot." Rearing is rarely practised. Any cow or heifer not showing promise after calving is milked and fed out for beef, the milk being sold to a local factory. An analysis of the sales of cattle over a five-year period gives interesting information as to the head of stock maintained and indicates the methods of disposal :—

SALES OF CATTLE

Condition in which sold	1923	1924	1925	1926	1927
Fat	141	99	112	153	124
Stores	67	130	58	28	74
New calvers ..	3	29	31	36	36
Bad doers ..	3	5	1	5	3
Total ..	214	263	202	222	237

Mr. Long's figures for the five-year period 1923–1927 show that, on the average, 232 cattle were purchased each year at an average price of £13 10*s.* 0*d.*, and that an average of 227 head were disposed of annually at an average price of £23 10*s.* 0*d.*, leaving an average margin of £10 per head between the purchase and selling prices.

After the cattle, sheep provide the most important revenue. A standing flock of 120 to 140 Devon Long Wool ewes is kept, and 50 to 60 ewe hoggets are wintered to replace draft ewes. The other lambs are reared and fattened for the London market. The sheep run over the most recently laid-down grass and on the drier pastures. Certain of the more marshy fields are too wet for sheep. A little concentrated food is fed to the flock during the winter. For various reasons sheep have shown a greater disparity in income than cattle, over a five-years' period. This was caused in one season by the incidence of lamb dysentery, which is now better understood and more readily controlled, and by fluctuations in the market value of sheep and wool.

A comparison of the results obtained in 1924 and 1926 make this evident. In 1924, draft breeding ewes realized £5 per head; in 1926, 58*s.* per head was received. Similarly, fat lamb was sold at 1*s.* 7½*d.* per lb. in 1924 and 1*s.* 5*d.* per lb. in 1926. Wool realized 1*s.* 3*d.* per lb. in 1924, and 9¾*d.* per lb. in 1926. Coincident with the lower prices realized in 1926, was the outbreak of infectious dysentery already mentioned, which killed more than half the lambs from 3–7 days after birth.

The statistics show in tabular form the gross output of the farm, the expenses incurred in producing this output, the output and the expenses per 100 acres, and the loss or gain per 100 acres.

GROSS OUTPUT OF THE FARM

Items	1923	1924	1925	1926	1927
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cattle ..	2,010 18 5	2,219 12 11	2,492 18 2	2,153 18 4	2,261 9 5
Sheep and Wool ..	509 2 0	637 6 8	493 16 5	226 4 2	318 18 8
Pigs ..	72 12 0	93 8 10	106 14 4	61 8 9	50 1 1
Dairy and Poultry	59 14 0	44 4 0	113 5 0	160 1 7	141 0 5
Corn ..	21 0 0	6 7 0	2 10 0	—	—
Hay and straw ..	52 14 7	17 19 3	11 5 0	—	—
Potatoes and Roots	13 0 0	13 0 0	13 0 0	13 0 0	—
Sundries ..	164 0 10	146 10 10	81 13 11	76 1 9	117 15 1
Total ..	£2,903 1 10	£3,178 9 6	£3,315 2 10	£2,690 14 7	£2,889 4 8

EXPENSES INCURRED IN PRODUCING GROSS OUTPUT

Items	1923	1924	1925	1926	1927
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Rent ..	466 12 0	466 12 0	466 12 0	466 12 0	466 12 0
Rates ..	69 11 10	51 8 7	56 10 3	60 5 10	54 5 3
Wages ..	477 14 0	506 17 11	479 7 5	489 7 3	521 16 11
Feeding Stuffs ..	933 6 7	921 13 9	1,236 3 4	1,019 1 6	1,119 1 1
Manures ..	145 9 2	159 6 10	105 16 4	152 18 7	118 1 6
Seeds ..	48 19 6	26 13 4	25 1 11	17 8 6	23 13 8
General Expenses	286 2 0	323 13 3	213 7 3	278 7 11	346 6 10
	2,427 15 1	2,456 5 8	2,582 18 6	2,484 1 7	2,649 17 3
Profit ..	475 6 9	722 3 10	732 4 4	206 13 0	239 7 5
Gross Output ..	£2,903 1 10	£3,178 9 6	£3,315 2 10	£2,690 14 7	£2,889 4 8

It should be noted that the term profits covers interest on capital invested, but no allowance has been made for salary for supervision of the farm.

GROSS OUTPUT PER 100 ACRES

Item	1923	1924	1925	1926	1927
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cattle ..	410 7 10	452 19 9	508 15 2	439 11 6	461 10 6
Sheep and Wool ..	103 17 11	130 1 4	100 15 7	46 3 3	65 1 10
Pigs ..	14 16 4	19 1 5	21 15 7	12 10 9	10 4 3
Dairy and Poultry	12 3 8	9 0 5	23 2 3	32 13 5	28 15 7
Corn ..	4 5 9	1 5 11	0 10 2	—	—
Hay and Straw ..	10 15 3	3 13 4	2 5 11	—	—
Potatoes and Roots	2 13 1	2 13 1	2 13 1	2 13 1	—
Sundries ..	33 9 6	29 18 2	16 13 5	15 10 7	24 0 7
Total ..	£592 9 4	£648 13 5	£676 11 2	£549 2 7	£589 12 9

EXPENSES INCURRED PER 100 ACRES

Item	1923	1924	1925	1926	1927
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Rent ..	95 4 6	95 4 6	95 4 6	95 4 6	95 4 6
Rates ..	14 4 1	10 9 11	11 10 8	12 6 1	11 1 5
Wages ..	97 9 9	103 9 0	97 16 7	99 17 5	106 10 0
Feeding Stuffs ..	190 9 6	188 1 11	252 5 9	207 19 6	228 7 6
Manures ..	29 13 7	32 10 6	21 11 10	31 4 2	24 2 0
Seeds ..	9 19 11	5 8 10	5 2 5	3 11 2	4 16 8
Sundries ..	58 7 10	66 1 1	43 10 10	56 16 3	70 12 8
Total ..	£495 9 2	£501 5 9	£527 2 7	£506 19 1	£540 15 9

The average profit and loss on the group of five farms in West Devon and East Cornwall, of which this farm is one, is shown by Mr. Long in the Table overleaf (p. 366).

AVERAGE PROFIT AND LOSS

	Acres	*Arable land* Per cent.	*Temporary grass* Per cent.	*Permanent grass* Per cent.
Group average ..	341	8·4	6·2	85·4
P7	490	8·2	1·6	90·2

LOSS OR GAIN PER 100 ACRES IN £

Year		*Total output*	*Total expenses*	*Profit or Loss*
1923	Group	£490	£534	Loss, £44
	P7	£592	£495	Profit, £97
1924	Group	£576	£572	Profit, £4
	P7	£649	£501	Profit, £148
1925	Group	£610	£586	Profit, £24
	P7	£677	£527	Profit, £150
1926	Group	£478	£514	Loss, £36
	P7	£549	£507	Profit, £42
1927	Group	£384	£482	Loss, £98
	P7	£590	£541	Profit, £49

* * * * * *

THE COMPOSITION OF KITCHEN WASTE

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WASTE food material, from the kitchens of hotels, restaurants and other public eating houses in the larger cities of this country, is systematically disposed of to farmers for the purpose of pig feeding.

The correct utilization of this kitchen waste as an animal food appears to have escaped the attention of scientific investigators, and little reliable information concerning its composition is available. Hence, the stock feeder has had to rely almost entirely upon his own personal judgment and experience.

From a study of the few references available, there is evidence of considerable difference of opinion as to the probable feeding value of what is commonly termed "pig swill." Barton (1)* states: "The writer advocates complete abolition of the swill-tub, so far as the feeding of pigs is concerned. It only represents a cesspool of garbage, and any material value it gives is only through the additions—meal, etc.—supplied by the pig feeder. It is quite time that these collections of sour food gave place to a more rational and intelligent system of feeding. There should be a ban on the swill-tub."

*References will be found on page 373.

This writer is probably referring to household refuse, but as Bonnett (2) points out "the swill which comes from hotels, and other important places, where there is always a large amount of good food wasted, is more valuable than that which comes from private houses, where, as far as may be, economy is often practised." This latter authority admits that under certain circumstances, and when properly handled, pig swill is of some feeding value.

Isolated feeding trials have been carried out from time to time in this country, the value of the material fed being estimated on the basis of live weight increase. This phase of the subject is one with which the authors are not, at present, concerned; in any case, the absence of information as to the composition of the swill used must seriously detract from the significance of such results as have been obtained.

The feeding of kitchen waste or "garbage," as it is known in America, is practised on a large scale in that country. It is stated (3) that, omitting the production of garbage by cities of under 10,000 inhabitants, and by the suburban farm population, which disposes of almost all its refuse by feeding, the waste food products of over 8,000,000 people are being fed to pigs. This quantity is said to be sufficient, if handled and fed under ideal conditions, to produce approximately 80,000,000 lb. of pork per annum. The utilization of garbage in America has been discussed by Henry and Morrison (4), Coburn (5) and others, but very little information as to the actual composition of this material is given. Ashbrook and Wilson (3) state that the contents of cantonment garbage, as determined by the U.S. Bureau of Chemistry, are as follows:—

	Percentage
Protein	15-18
Carbohydrates	31-69
Fat	13-33
Ash	16-36

The above figures are calculated on an air-dry basis.

The same authors refer to a sample of Louisville municipal garbage that, on analysis at the Kentucky Experiment Station, showed the following composition, on an air-dry basis:—

	Percentage
Protein	21·5
Carbohydrates	41·8
Fat	23·4
Ash	13·3

It seems to be generally agreed that the composition of kitchen refuse is liable to great variation; Crowther (6)

states that "this material is so extremly variable that it would be difficult to generalize concerning its value." Apart from the two analyses recorded above, the writers were unable to obtain any data relative to the chemical composition of kitchen waste.

Scope of Investigation.—The investigation here described was undertaken at the request of the Northumberland and North Durham Agricultural Valuers' Association, which desired to obtain a residual value figure. It was at the same time considered worth while, by extending the scope of the work, to obtain authentic information concerning the value of kitchen waste as a feeding stuff, and to determine the extent and significance of variation in the quality of material produced by public eating-houses of different classes. It was originally intended to study the composition of "swill" drawn from various sources in the larger towns of Northumberland and Durham. Lack of time and facilities, however, so limited the scope of the work that it was found necessary to confine it to the City of Newcastle-on-Tyne.

The public eating-houses of this city were roughly graded as follows: (1) Hotels; (2) Restaurants; (3) First-Class Cafés; (4) Second-Class Cafés.

It was not anticipated that there would be any material difference in the quality of the refuse produced by the first two grades. In the majority of cases, hotels are, in fact, restaurants; it was considered desirable, nevertheless, to differentiate between the two. Under "first-class cafés" are included such places of refreshment as are frequented by ordinary business men and middle-class people. The term "second-class café" is intended to cover eating-houses of the type used by manual workers.

The first and second-class cafés, from which samples were drawn, belonged to catering concerns of good repute, and are probably differentiated by class of patron and price, rather than by the character of food served.

The time available for carrying through this investigation was only six months, and it was decided to obtain a series of samples at weekly intervals during this period from one representative of each of the grades referred to above.

Sampling.—Airtight, cylindrical containers, 12 in. in height and 6 in. in diameter, of heavy block tin and fitted with press-in lids secured by clamps, were made for the purpose of

conveying samples, the latter being taken by means of a scoop fitted with a telescopic handle.

It was found that in the majority of kitchens, the refuse is not bulked, but is classified according to the type of material which predominates in it; each type being placed in a separate bin. In some cases as many as four classes of swill were recognized.

The arrangements existing in the kitchens of the hotel, restaurant and cafés from which samples were obtained are as shown below :—

	Number of classes	*Character of material in classes*
Hotel	Four	Vegetable refuse. Meat refuse and plate scraps. Pudding refuse and plate scraps. Fish refuse.
Restaurant ..	Two	Vegetable refuse. Meat refuse and plate scraps.
First-class café ..	One	All material.
Second-class café ..	Two	Vegetable refuse. Plate scraps.

In obtaining samples from kitchens where the swill was sorted into two or more classes, care was taken to ensure that proportionate amounts of each class were mixed.

Analytical Methods.—The usual methods for the routine chemical analysis of foodstuffs were employed. Difficulty was experienced in drying certain samples of high oil-content. As a result of the inability of the remaining constituents of the dry matter to absorb the large amount of oil which separated, it was almost impossible to obtain a sample which would permit of easy manipulation. It was thought that this difficulty could be surmounted by the addition of a known weight of some absorbent material, the constituents of which would not unduly interfere with the subsequent analytical operations. The addition of kieselguhr before sieving, and in quantities varying from 5 to 25 per cent. of the dry matter weight of the sample, gave satisfactory results. The kieselguhr was purchased in bulk, analysed, and corrections applied for the small quantities of moisture and ash it was found to contain.

Results.—The mean percentage composition of the kitchen refuse, produced over a period of eighteen weeks by four

eating-houses of different grade, and calculated on a dry-matter basis, is shown in Table I :—

TABLE I.—MEAN PERCENTAGE COMPOSITION OF KITCHEN REFUSE, CALCULATED ON DRY-MATTER.

	Hotel	Restaurant	First-class café	Second-class café
Oil	22·91	19·66	17·29	20·89
Crude protein	25·14	17·06	12·81	15·28
Carbohydrates	40·84	55·36	56·74	53·34
Fibre ..	2·31	1·81	3·36	3·15
Ash	8·80	6·11	9·80	7·34
Total ..	100·00	100·00	100·00	100·00

The fact that kitchen refuse contains large amounts of fat is well known to those who are in the habit of feeding it ; indeed, the boiling of swill is practised not only for the purpose of sterilizing it, but as a means of partial degreasing. As in the case of other constituents, the oil content of samples from all sources showed considerable week to week variation. One sample obtained from the hotel contained the extraordinarily high percentage of 45·30 per cent. ; on another occasion swill from the same place contained as little as 8·50 per cent.

From a consideration of Table I, it is obvious that the hotel swill is outstanding in respect of crude protein content. The mean figure recorded here is appreciably higher than the percentage shown in either of the American analyses previously mentioned.

The mean carbohydrate content is to some extent a reflection of the sum of the mean oil and protein percentages. Hence it is to be expected that the hotel swill would be comparatively poor in the first-named constituent ; it is, in fact, significantly poorer than that produced by any other grade. There is remarkably little variation between the restaurant and café swills.

The mean crude fibre content of swills from all sources, as shown in Table I, is so small that it is doubtful whether it can have any appreciable effect on the feeding value. It is not certain that all of the material described here as " fibre " is fibre in the accepted sense of the word and, in the circumstances, the writers do not propose to attempt any explanation of the variations shown by the mean figures.

It is extremely difficult to account for the marked and, in most cases, significant variations in the mean ash contents. Hand-and-eye analyses of the hotel refuse revealed it as being consistently rich in raw fish-waste, a circumstance that would account for its high percentage of ash. In the

case of the restaurant and second-class café, meat scraps were the main source of protein and, in the absence of any considerable amount of bone, would contribute little toward the ash. The first-class café swills were characterized throughout by the large amount of vegetable material they contained, and their abnormally-high ash-content seems incapable of explanation. It may be worth noting, however, that there were no mechanical arrangements in this kitchen for the washing of potatoes prior to peeling, and that an appreciable amount of soil may find its way into the swill tub.

From the results shown in Table I, it is evident that there are considerable differences in the quality of kitchen wastes derived from various classes of eating-house. That these differences are of significance has been shown elsewhere.* The expectation that the quality of the swill, as judged by protein and oil content, would vary directly as the class and "expensiveness" of the place of origin has not been completely realized. If this material is to be regarded as a medium protein-concentrate, normally containing rather excessive quantities of oil, then the hotel swill shows a very definite superiority over that from any other source. As was expected, the restaurant waste occupied the second place, but the sequence was badly upset by the two cafés. It would be unwise to generalize from the results obtained in this investigation, but in spite of the figures given in Table I, it is probable that, in the great majority of cases, the waste produced by an eating-house of the type described here as "first-class café" will have a higher oil and protein content than that from a "second-class café."

The comparisons made above refer specifically to the dry matter of the various swills. It should be noted, however, that the raw swills showed considerable variation in dry matter content, a fact that might vitiate the conclusions that have been drawn from the figures in Table I. The actual mean analyses of the raw swills, as received in the laboratory, are shown in Table II.

It is apparent that the conclusions arrived at from a consideration of the dry matter figures are somewhat affected though not seriously. The restaurant swill, with its high percentage of dry matter, is now only slightly inferior to that

* All of the analytical results obtained in the course of this work were statistically treated and embodied in a paper read before the Northumberland and North Durham Agricultural Valuers' Association on July 25, 1930.

TABLE II.—MEAN ANALYSES OF RAW SWILLS

	Hotel Per cent.	Restaurant Per cent.	First-class café Per cent.	Second-class café Per cent.
Moisture ..	76·53	69·63	79·22	68·99
Oil	5·38	5·97	3·59	6·47
Crude protein	5·90	5·18	2·66	4·73
Carbohydrates	9·58	16·81	11·79	16·56
Fibre ..	0·54	0·55	0·70	0·98
Ash	2·07	1·86	2·04	2·27
Total ..	100·00	100·00	100·00	100·00

from the hotel. The second-class café refuse also improves its position in the sequence; indeed, it now shows the highest oil content, although it still contains considerably less protein than material from hotel and restaurant. The inferiority of the first-class café refuse is accentuated.

As already indicated, kitchen refuse derived from different sources shows considerable variation in mean composition; despite this variation, swills may be regarded broadly as foods of the same type. In any case they are not well balanced, and invariably contain excessive quantities of oil. The foodstuff which remains after partial degreasing may be regarded as a medium protein-concentrate.

While this article is concerned primarily with the composition of kitchen waste, it is desirable that some reference should be made to the precautions that must be observed in using the material. Occasional losses do occur among swill-fed pigs. Such losses are usually ascribed to the presence of soap, but there are a number of other possible causes. The occurrence of salt in injurious quantities must not be overlooked, although the investigations of the writers indicated that trouble from this source is very unlikely.

It is, of course, now obligatory under the Foot-and-Mouth Disease (Boiling of Animal Foodstuffs) Order of 1927, Section 1, to boil all kitchen refuse for at least one hour before use, and during this process a considerable percentage of the oil is usually skimmed off. Despite this, the material may still contain rather large amounts of oil, and care must be taken in feeding it to young pigs or scouring may result. It is advisable to discontinue feeding this material to bacon pigs some time before slaughter. It may be interesting to note here that, although sterilization is compulsory in this country and is, on the whole, very desirable, it has certain disadvantages. As Ashbrook and Wilson (3) point out, boiling causes partial disintegration of the constituents of the swill, with diffusion of possibly injurious constituents (of which soap may be

cited as an example) throughout the mass. Consequently it is impossible for the pig to exercise any selection in eating.

Glass, bottle caps, and other foreign bodies which may find their way into the swill tub, and which are always apt to cause serious trouble, should, of course, be removed. The samples examined in the course of the investigation were singularly free from material of this character.

Feeding troughs should be kept scrupulously clean, and no uneaten material should be allowed to remain in them for any considerable period of time.

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(2) Bonnett, F., *Live Stock Journal*, June, 1927.
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(4) Henry, W. A., and Morrison, F. B., *Feeds and Feeding.*
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CARABID BEETLES AS STRAWBERRY PESTS IN THE CHEDDAR DISTRICT

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Introduction.—From time to time, there have been complaints of serious injury by Carabid beetles to the ripening strawberry crop in the Cheddar district. In 1927, for example, these pests were troublesome, and some tentative inquiries were made in the late autumn of that year; and in 1928 further observations and some small field trials were carried out. Early in 1929, a detailed investigation was commenced and continued until the end of the season in 1930, and a brief summary of the results is given in this article.

Thanks are due to various strawberry growers for their co-operation and to the Colston Research Society for providing a grant towards the expenses of one of the investigators.

A definite attempt was made (1) to determine the species of beetles actually responsible for the injuries, and the type and degree of such damage, (2) to investigate the life histories of such species as proved to be harmful, and (3) to discover means of prevention or control.

Injuries occurred during the season of 1928, but they were more limited and sporadic in character than in 1927; they

became slight in 1929 and were almost absent during 1930. As a result, therefore, although the data required under the above headings (1) and (2) were secured to a large extent, progress with control work was greatly hampered and extensive series of trials were abortive, more especially during 1930. The probable reasons for this will be explained below.

The principal type of injury consists of the cracking and removal of the seeds of the berries when they are ripe or nearly so. This injury spoils the appearance of the fruit, rendering it unsaleable, the berry becoming soft and discoloured and finally shrivelling. On occasion green fruit is also attacked, proper development being prevented. Other forms of damage also occur and are described below.

Distribution and Amount of Injury.—The main type of injury has long been known and described, and was correctly attributed to Carabid beetles, both in this country and on the Continent. Although these beetles are abundant everywhere, serious injuries are only reported from certain districts. During the period of this investigation, severe damage was recorded in the Eastern counties; a few serious outbreaks occurred in Kent, and limited outbreaks were reported from Hants and Devon. The amount of damaged fruit may reach 70 per cent. of the crop, whilst injuries of 50 and 60 per cent. are frequently reported. In the Cheddar district, the damage appears to be specially severe in rows of strawberry plants near hedgerows and headlands. If picking time of the earliest fruit coincides with the optimum climatic conditions for the Carabid beetles, the financial loss becomes considerable. A marked feature of these attacks is their discontinuity and sporadic distribution. The beds affected in one year may be free from attack during the following season, whilst a neighbouring bed—hitherto free—may be ravaged; one part of a bed may be attacked this season, and another part next year. At first sight these peculiarities appear most puzzling.

The Beetles Causing the Injuries.—The beetles causing these injuries belong to the family *Carabidae*, often known as "Ground Beetles." The members of this family are numerous and widely distributed, occurring in soil, under stones, moss, bark, &c. They are active, generally dark or metallic in colour and as a rule are carnivorous in habit, although certain species (including some of those now under discussion) have been recorded as damaging plants, including beet and cereals. The

larval stages are likewise active and predaceous. Numerous species occur on strawberry beds and, in the course of the observations in the Cheddar district, some thirty were obtained from the trap plots utilized. Many of these had clearly nothing to do with the injuries and others were scarce. Six very abundant species, however, were suspected or had previously been implicated more or less surely, and these were selected for observation and investigation.* The chief culprit is the species scientifically known as *Ophonus pubescens* (*Harpalus ruficornis*) and, as far as can be ascertained, it is responsible in the main for the injuries complained of. This insect, which it is proposed to call the Strawberry Seed Beetle, is ½ to ⅝ in. in length and may be recognized by the greyish-golden hairs with which the wing-covers (elytra) are covered, and by the red-brown legs (Fig. 1). Two other species (*Pterostichus madidus* and *P. vulgaris*) may also cause quite serious damage of a different kind by attacking the flesh of the berries, in which they eat holes, often of considerable size and much resembling the work of slugs and certain birds. Both are shining black beetles, about ½ to ⅝ in. in length, very similar in general appearance (Figs. 2 and 4, respectively). There is no evidence that they attack the seeds or cause blemishes similar to those due to the activities of the Strawberry Seed Beetle.

The types of injury are shown in Figs. 5 to 8. These were obtained by potting up strawberry plants bearing ripening fruits in cages in the insectary at Long Ashton during each season. Injuries were readily produced by beetles introduced into the cages from the affected fields.

This account of the kind of damage done and of the beetles concerned refers to the Cheddar district and it is possible that other species may be associated with injuries to fruits in other districts.

Life Histories and Habits of the Beetles.—The life histories of the species described have been investigated during the course of this work and the main features have been elucidated. Considerable trouble was encountered in regard to the Straw-

* The following are the scientific names of the six species referred to :—(1) *Ophonus pubescens* Mll. (*Harpalus ruficornis* F.); (2) *Abax ater Vill.* (*striola* F.); (3) *Pterostichus madidus* F.; (4) *Pterostichus vulgaris* L.; (5) *Pterostichus cupreus* L.; (6) *Nebria brevicollis* F. The first four are shown in Figs. 1 to 4, respectively; the last two, although sometimes present on the beds in large numbers, have not been found to be injurious. *Abax ater* has only once caused injury in the writers' experience (under controlled conditions). It is a large insect, ⅝ to ¾ in. in length, of a uniform shiny black; it can be distinguished by the quadrangular thorax, which has sharp angles.

berry Seed Beetle, which proved difficult to rear under laboratory conditions, and its life cycle differs somewhat in time from that of the three others. In general there is considerable agreement in respect of habits, food and reaction to varying environments.

The injurious species are mainly nocturnal in habit and prefer to hide in the soil, amongst weeds, under stones, etc., by day, particularly during bright weather. Further, they dislike drought conditions and bury or hide themselves during such periods. They appear to be most active on the surface during warm, damp periods, and the greatest amount of injury seems to occur then. Thus, it appears that when dry weather (and dry surface soil) is followed by a reasonable amount of rain during the fruit-picking period, an attack is likely to result. The ripening period in Cheddar usually extends from the end of May to early July. A comparison of weather records with the history of beetle damage during the past four years strongly supports the above observations. The ripening periods of 1927–30 have shown decreasing rainfall and the amounts of crop injury have been correspondingly reduced.

The female beetles lay eggs in batches of 10 to 15 on the surface of damp soil or within burrows they have made, the eggs of the Strawberry Seed Beetle being the largest and least numerous. Adults are most abundant from June to October. The larvae are elongate in form, are very active and generally feed on various small creatures in the soil as long as suitable weather and soil conditions allow. It has, however, been found that a mixed animal and vegetable diet is often preferred, and this is particularly so with the Strawberry Seed Beetle. They pass through three stages (or instars) during their life history and are very intolerant of dry conditions. Most are in their third stage by January, though the Strawberry Seed Beetle does not reach this stage until a good deal later.

Numbers of adults overwinter, either deep in the soil (more particularly in worm holes and in the vicinity of plant roots) or in banks, hedges or turf heaps. It does not seem (about Cheddar) that many pass the winter in the soil beneath the fields, the majority going to the banks surrounding the small fields so typical of the district. They avoid decomposing sodden rubbish such as is frequented by woodlice. In spring, the hibernated and newly emerged adults again become active, and mating and egg-laying proceed.

Control Measures: *Trapping.*—The usual method employed against these pests is that of "trapping." This is

To face page 376.

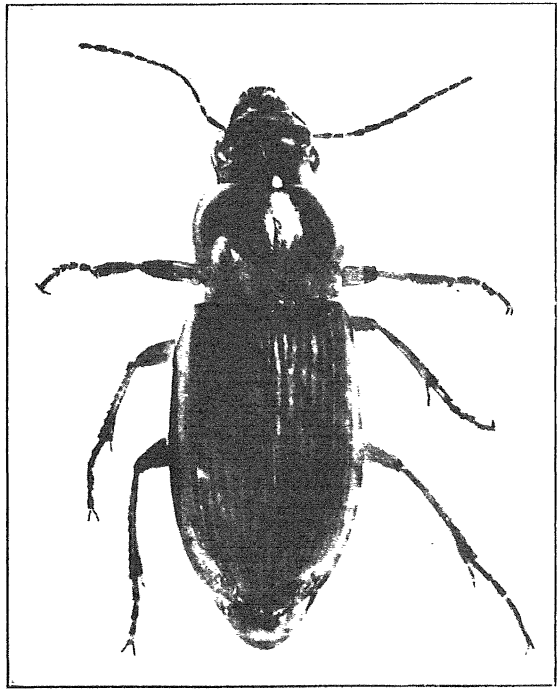


FIG. 1.—The Strawberry Seed Beetle (*Ophonus pubescens*).

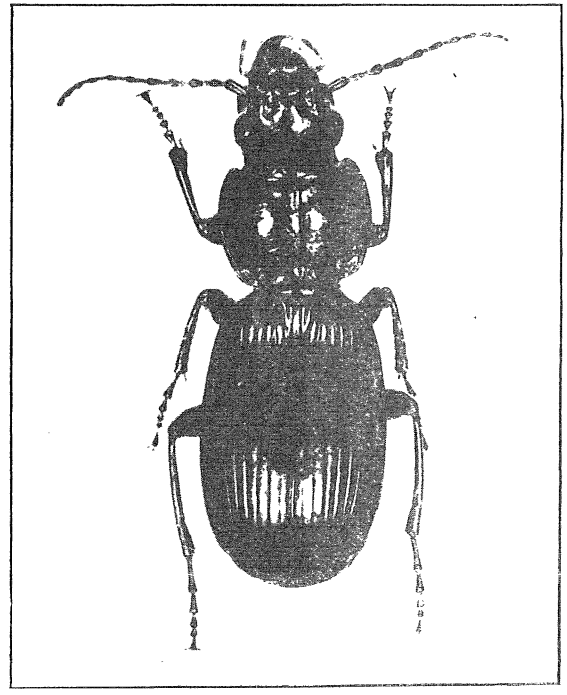


FIG. 2.—*Pterostichus madidus*.

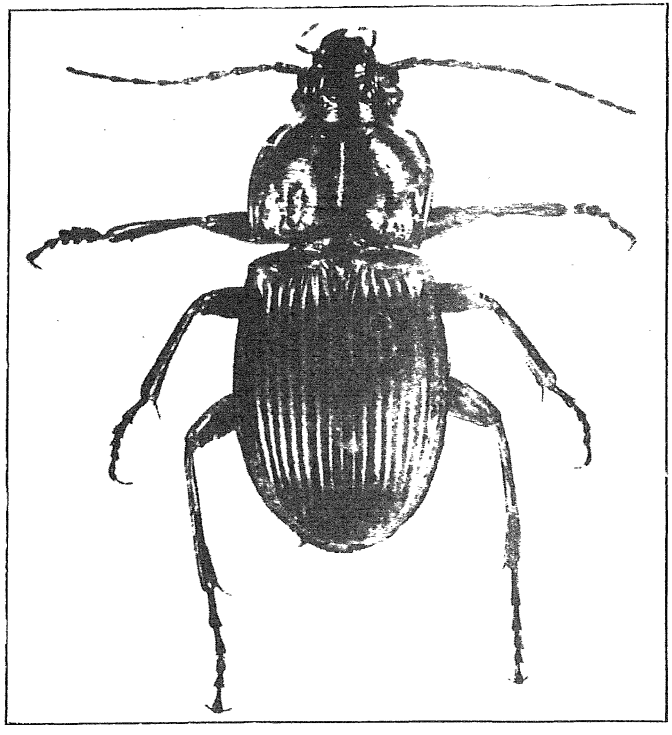


FIG. 3.—*Abax ater* (*Striola*).

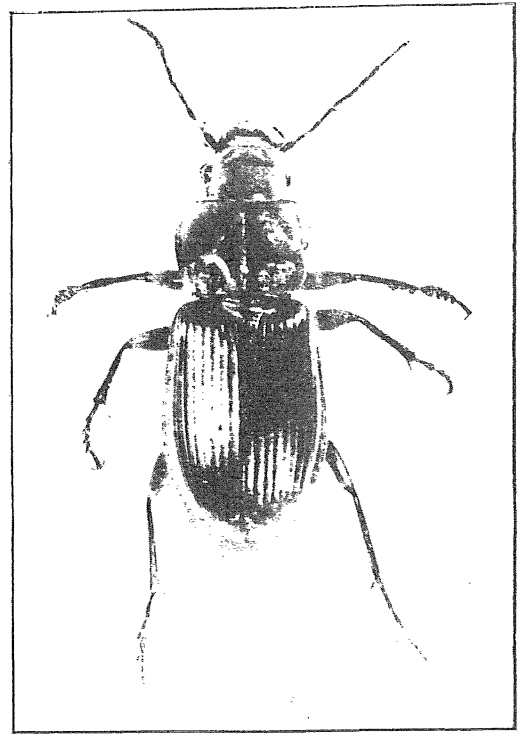


FIG. 4.—*Pterostichus vulgaris.*

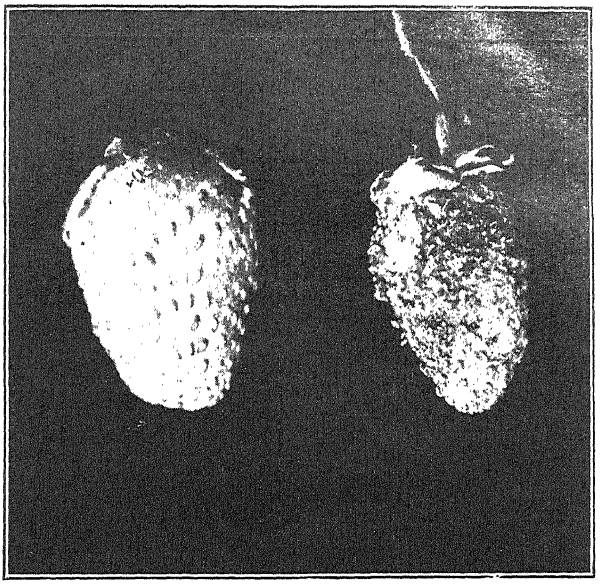


FIG. 5.—Undamaged fruit.

FIG. 6.—Damaged by the Strawberry Seed Beetle (*O. pubescens*).

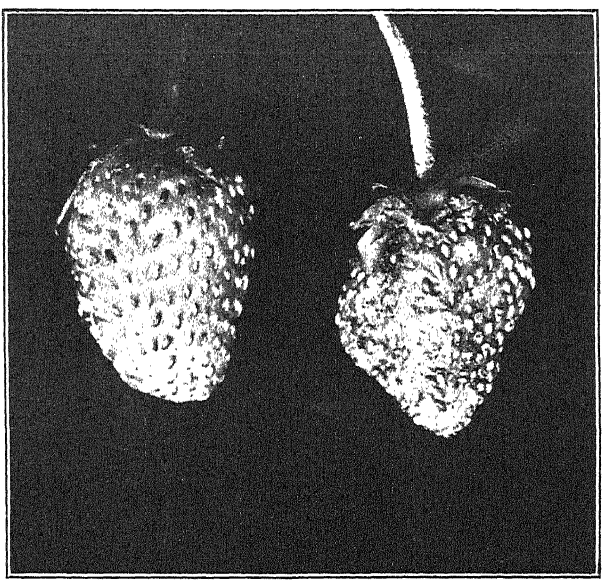
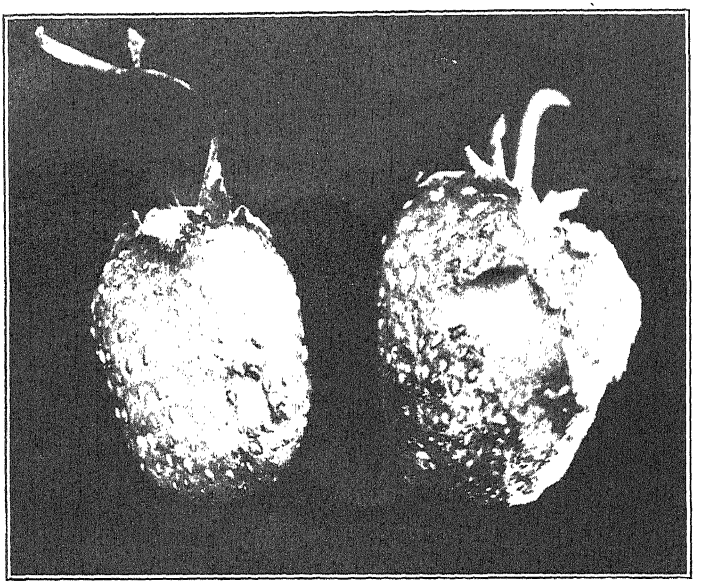
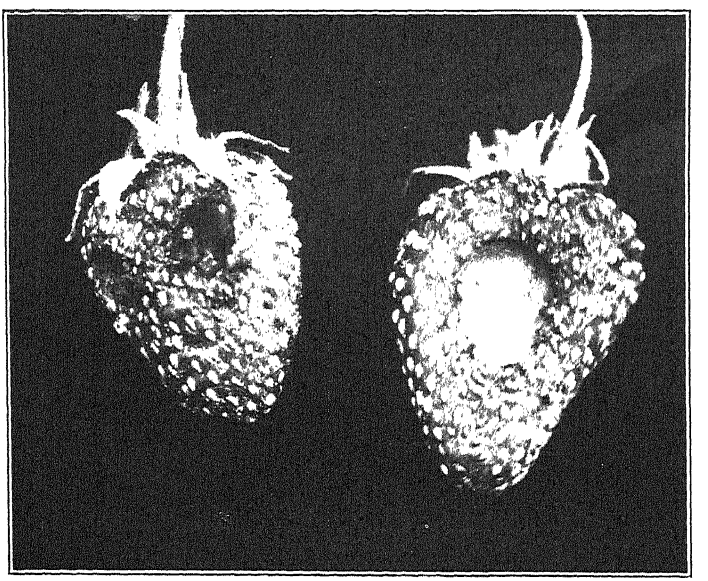


FIG. 7.—Slightly damaged by *Abax ater*.

FIG. 8.—Severely damaged by *Abax ater*.



FIGS. 9 and 10.—Damage by *P. madidus*.



FIGS. 11 and 12.—Damage by *P. vulgaris*.

frequently performed in a haphazard and perfunctory way, and consists in putting down in the beds a number of jars of various sorts and sizes into which beetles of all kinds fall at hazard. In some cases " baits " of liver or other offals may be added. It is obvious that great numbers may be caught by this means, but there seems little evidence that it is effective in reducing the beetles sufficiently to prevent or minimize the damage done.

With the object of obtaining definite evidence, three plots—all having a history of previous damage—of 1/10th acre each, were selected in 1930, and 45 two-pound jars per plot were set in the earth at regular intervals, with " control " (untreated) plots alongside and between them.

The total catches were removed at fairly regular intervals between March and November, the beetles being identified, counted and tabulated. Interesting data were thus obtained as to sequence, relative abundance, etc., of the harmful (and other) species, but the main object was not attained, since no attack developed on either the " trapped " or " control " plots. Further experiments are needed to determine whether trapping provides a reasonable method of control.

Dressings.—NAPHTHALENE (in various forms) has been used to a considerable extent, generally broadcast amongst the ripening crop. Several growers have claimed that this deterrent has had the desired effect in preventing attack, and an endeavour was made during 1929 and 1930 to investigate these statements. Here again no definite evidence was obtainable owing to the non-appearance of injuries on either treated or untreated plots. Further, on most of the plots where the growers claimed success, the dressings were applied coincidently with the onset of dry conditions.

SODIUM FLUOSILICATE.—Small plots were dressed with this dust after attacks had commenced in 1928, and injuries ceased on these areas although continuing on the untreated portions. Unfortunately, the dust injured the ripening fruits. Further experimental dressings in subsequent years, put on before the ripening of the crop, were vitiated (as in other experiments) by absence of attacks, but no apparent damage was done to flowers, immature fruit, runners or foliage, which were heavily dusted during the dry conditions of 1930.

PYRETHRUM.—Sprays of varying strengths applied to badly attacked plots in 1928 showed no reduction in injury. Neither fruit nor foliage was damaged by the spray.

Preventive Methods of Control.—It seems clear that definitely hopeful results are obtainable by preventive measures, and

attention is drawn to the following points which have been noted during the course of the investigations :—

(1) Removal of shelter in which beetles can either overwinter, or find harbourage during the daytime, or during drought, in the vicinity of the strawberry beds. This includes—(*a*) banks of earth from which beetles certainly emerge in spring: (*b*) heaps of earth or sods, which provide shelter for great numbers of beetles by day and during dry weather. (In one particular case, injuries were severe on either side of a long mound of sods, and the presence of the Strawberry Seed Beetle within it was proved ; on removal of the mound, the injuries ceased. Damage is frequently most serious on headlands and near banks and hedges): (*c*) weeds, which are sometimes allowed to accumulate as the crop ripens, undoubtedly conserve moisture and provide shelter by day, as do rough headlands and field corners.

(2) Clean cultivation not only ensures the absence of sheltering weeds, but a fine tilth maintains a layer of soil too dry for beetle larvae to live in, and unsuitable in moisture content for the adult insects. It is believed that differences in moisture content probably play a considerable part in bringing about concentrations of beetles on certain fields or parts of fields.

(3) Observation suggests that a judicious use of poultry can do much to keep down the beetle population, particularly on the headlands, and can, in some instances, be utilized as a barrier to incoming beetles from rough land, banks, etc., although it must be remembered that the Strawberry Seed Beetle is able to fly.

Summary.—Four species of Ground Beetles have been proved to be the cause of injuries to ripening strawberries at Cheddar and elsewhere. One species—*Ophonus pubescens* (here called the Strawberry Seed Beetle)—is responsible for the worst type of damage, namely, the removal and ingestion of the seed contents, thereby ruining the fruit. The other species either cause less marked injuries, or gnaw holes in the fruit.

These various types of damage have been produced under controlled conditions, and are figured in this article. The life histories of these beetles have been worked out. Overwintering of both larvae and adults is shown to take place, to a considerable extent, chiefly in hedges and banks.

Dry conditions appear to be inimical to the beetles in both the larval and adult conditions.

Attempts to test out the value of trapping as a means of reducing beetle populations and of naphthalene as a deterrent

were both vitiated by absence of injuries, largely due to drought conditions.

Injury can probably be minimized by the removal of shelter, by clean cultivation and the judicious use of poultry.

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SOIL SURVEYS

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NOTICES of soil surveys carried out in different parts of the country have appeared from time to time in this JOURNAL. During recent years, however, considerable changes have taken place in methods of classification and mapping. These changes are due partly to contact with foreign workers, but also, in a great degree, to the increase in the amount of survey work in this country made possible by special grants from the Ministry for work in certain advisory provinces. It may, therefore, be of interest to give an account of the principles underlying modern soil surveys and to describe the methods actually in use.

In the earliest soil surveys carried out in this country, the basis of classification and mapping was purely geological. On the assumption that each geological formation, due regard being paid to lithological variations, gave rise to its own type of soil, the survey consisted mainly in the collection and examination of typical soils from each outcrop. The surface geological map could thus, with interpretation, serve also as the soil map. This method of survey, whilst generally valid for the conditions of south-eastern England, as exemplified by the work of Hall and Russell in Kent, Surrey and Sussex, did not prove equally applicable to other parts of the country. In the first place, over most of Great Britain north of the Thames there are extensive spreads of glacial and other superficial deposits. These vary in thickness and, to complicate the task of the soil surveyor still further, are often of variable and uncertain origin. The term boulder clay may itself lead to much confusion, since it embraces a wide range of textural grades from clay to sand. Secondly, climate, topography, altitude, drainage, and other circumstances may result in very different soils being formed from the same parent material. Indeed, it has been found in extreme cases that the effect of geology may be almost obliterated by the

operation of the soil-forming processes, with the result that similar soils may be formed from different parent material.

The experience of soil survey workers, notably those in Russia and the United States, has taught us that, in studying the field relationships of soils, the only satisfactory basis of classification is that furnished by the actual properties of the soil itself, and that the proper unit of study is the complete soil profile.

The soil profile is the succession of horizons from the surface soil down to the parent material, which may be solid rock, glacial drift, or any material from which soil is formed. The character of the soil profile reflects both the nature of the soil-forming processes and also the effect of the parent material on which they have operated. It may be modified by cultivation, with the result that profiles of agricultural soils differ considerably from those of the virgin soils from which they have been reclaimed. The soil profile, preferably studied on virgin soils, is the basis for the natural classification of soils and the great world groups are distinguished by characteristic profiles.

The processes which lead to the differentiation of soils into horizons are mainly connected with the movements of water in the soil. These movements are governed by the relative intensity of rainfall and evaporation. In arid climates, where evaporation predominates over rainfall, the tendency is for soluble salts to accumulate at or near the surface. In semi-arid climates, where the leaching action of the rainfall is more pronounced, the soil profile is characterized by the accumulation of an horizon of calcium carbonate, often accompanied by calcium sulphate. The depth at which this horizon occurs increases with the intensity of the leaching.

In humid climates, rainfall predominates over evaporation and the soil profile is subjected to leaching down to the water table. There is thus a complete washing out of soluble salts and also of calcium carbonate, with the consequent development of acid conditions. The complete expression of this type of soil formation in cool climates is seen in the so-called *podsol* profile (*see* Fig. 1), developed under a cover of heath or coniferous forest vegetation. In the podsol profile, the essential horizons are, beginning from the surface, A_0, a layer of peaty material; A_1, a layer of bleached greyish or even white material from which iron and aluminium oxides have been removed by leaching; B, a brown or reddish-brown horizon enriched by the deposition of iron and aluminium oxides

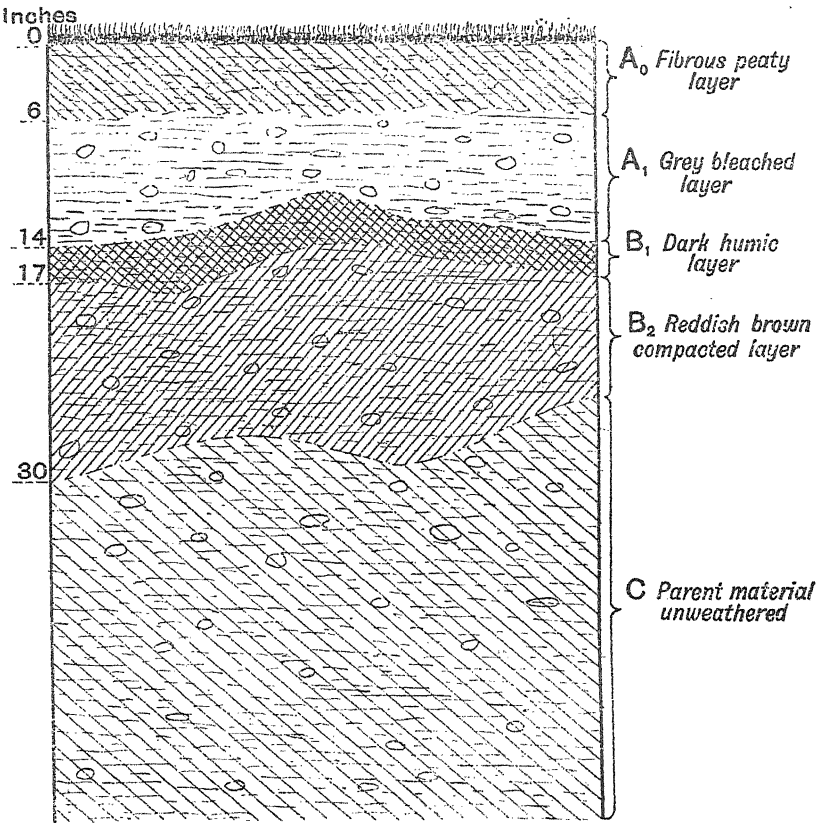


FIG. 1.—A PODSIL PROFILE.

leached from the A horizons; and C, the parent material. In the most extreme podsol types, there is also a leaching out and deposition of humic matter, with the result that the B horizon is black or dark brown in colour. Among the best examples of podsol profiles in England are those found on the Bagshot Sands of Surrey. Elsewhere in England, the differentiation into horizons is generally less pronounced, except on areas of light sandy soils in heaths. This is due partly to the fact that, except on very light soils, the leaching processes are not sufficiently intense for the development of good profiles, and partly to the effect of long continued cultivation, which tends to mix up the soil horizons and also to counteract the extreme acidity which is requisite for podsol formation.

Profile development in some cases leads to the formation of an impervious pan, which not only interferes with water

movements, but also restricts root development. Pans may be due to the effect of the mechanical washing down of the finer particles from the surface soil, or to the processes of solution and deposition such as occur in the formation of podsol profiles. In some cases, a combination of these two types of differentiation may occur. In any case, the occurrence of layers of varying mechanical and chemical composition exerts a profound influence on the conditions of plant growth in the soil and is, therefore, of importance in agricultural practice. The conclusions drawn from this method of study are evidently more valid and of wider application than those derived from the study of samples of soil and subsoil as in the earlier surveys, and may be expected to furnish suggestions as to the probable behaviour of soils under cultivation and cropping.

Those engaged in survey work in this country have for some years met periodically to discuss methods and to compare experience. They have also received much assistance from the Geological Survey, and most soil surveyors have had the opportunity of becoming acquainted with the methods of geological mapping. Although certain details remain to be adjusted, substantial agreement has now been reached regarding the lines on which soil survey work shall proceed in the future. In this connexion, it may be mentioned that soil surveyors are greatly indebted to the helpful counsel of Professor Linwood L. Lee, of New Jersey, who spent a year in this country and visited all the centres at which soil surveys were being carried out.*

It has been generally agreed that soil mapping shall be carried out with the six-inch Ordnance Survey maps as base maps. Agreement has been reached as to the data to be recorded on such maps in the field. The object in view is to secure that, in the actual mapping, all data of agricultural importance, as far as they can be ascertained, shall be recorded. These data refer to (1) surface; (2) stoniness; (3) texture; (4) colour; (5) water conditions; and (6) the nature of the soil profile succession. In addition, notes as to natural vegetation are recorded where possible. Appropriate symbols are used for the purpose of setting out the observed data on the maps. For example, in the case of texture, S stands for sand, Sa for light sand, Sb for sandy loam, L for loam, La for light loam, Lb for heavy loam, and so on. A complete

* Professor Lee also contributed to this JOURNAL an article on *Soil Surveys and their Utilization*, October, 1930, p. 653.

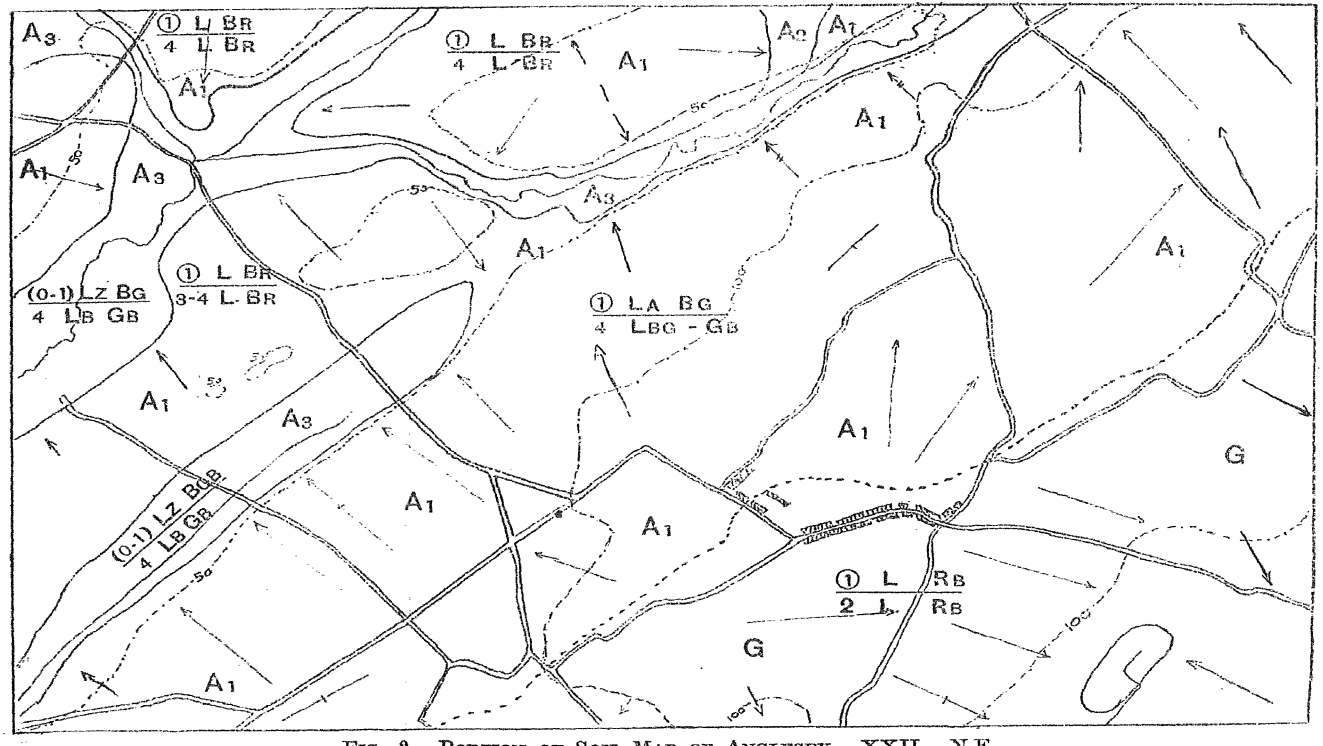


FIG. 2.—PORTION OF SOIL MAP OF ANGLESEY. XXII. N.E.

Series.—A1. Gaerwen loam to light loam; deep, well-drained soils derived from metamorphic schists. A2. Gesail heavy loam; soils derived from schistose material with impeded drainage. A3. Braint silty loam; alluvial soils from schistose material. G. Gower loam; rather shallow, well-drained soils from carboniferous limestone. The arrows point down slopes.

description might be set out as $\frac{(1)\text{Lb. Bg. }\beta}{4.\text{ C.G.}}$ This would signify a moderately-stony, greyish-brown heavy loam overlying a grey deep drift clay and subject to seasonal wetness. The data as to surface are recorded by means of arrows pointing down the slopes with differences to indicate degrees of steepness. An example of a soil map is shown in Fig. 2.

A complete record field by field, supported by analyses of typical soils, should give all the necessary soil data for agricultural purposes. It is desirable, however, to arrive at some system of classification in order to throw into relief the relationships of soils to each other, and to secure a readier presentation and generalization of the data obtained. It has been generally agreed among surveyors that a system based on that in use by the United States Soil Survey shall be used. The principal members in this system of soil classification are the soil *series*. A soil series is a set of soils derived from the same or similar parent material under similar conditions of climate, topography, and drainage, and showing the same general profile characteristics. Series are named after the localities in which they are first studied or where they attain a considerable development. The Powys series, recognized in the soil survey of Wales, may serve as an example. Soils of this series are derived as sedentary soils under conditions of free drainage from non-calcareous shales, flagstones, and mudstones of Cambrian, Ordovician and Silurian age. The profile consists of a brown or buff-brown shaly loam overlying a lighter brown or yellowish-brown subsoil of heavier texture. Variations in texture give such types as the Powys light loam, the Powys silty loam, the Powys heavy loam, and so on. It should be noted that, although the series are described in terms of geological parent material and mode of formation, the actual criteria for recognition are the characters of the profile. If, therefore, the same profile is given by soils derived from different parent material, there would be good reason for grouping them in the same series. For example, in the Welsh soil survey, there does not appear to be any real difference between the Bangor series derived from acid and intermediate igneous and pyroclastic rocks, and the Anglesey series derived under similar conditions from pre-Cambrian schist. If fuller study should confirm this impression the two series would be united into a single series. The Glamorgan series includes soils derived from Lower Lias limestones and also soils derived from Rhaetic beds.

For convenience of grouping, series derived from the same parent material may be considered as forming a *suite*. For example, the Powys suite consists of all soils derived from non-calcareous shales, flagstones, and mudstones of Cambrian, Ordovician and Silurian age. Varying conditions of formation distinguish the different series. The Powys series comprises the sedentary soils with free drainage, the Penrhyn series, the drift and hillwash soils with free drainage, the Cegin series, the drift soils with impeded drainage, and the Conway series, the alluvial and bottom soils. Other series of the same suite may be isolated on the basis of topography.

The advantage of arranging soils into series, as has been described, is that soils having the same general mineralogical and chemical composition, similar topography, and similar behaviour in respect to water conditions, are grouped together. When due allowance is made for climatic influences, it is reasonable to suppose that soils of the same series will be similar in agricultural behaviour and potentialities. The success of the classification into series will be reflected in the extent to which it tallies with the known agricultural characters of the soils classified.

The methods and instances described in the present account are taken from the soil survey of Wales and differ in some details from those applicable to other areas. A small committee set up by the Ministry is now attempting to correlate the soil survey work in different advisory provinces. For this purpose, a careful examination is made of the principal series recognized by individual surveyors in order to decide to what extent they can be identified with each other. If, for example, Series A in Area X proves to be identical with Series B in Area Y, and with Series C in Area Z, then, in future work, Series A, B and C may be considered as one series and mapped as such.

The principal use of the soil survey is as a basis for advisory work. An isolated inquiry, even when accompanied by a sample of soil for analysis, can rarely be answered satisfactorily unless a comprehensive view of local circumstances is possible. This can, of course, be most satisfactorily secured by a personal visit, but a reliable soil map carrying the kind of information indicated in the present article places the adviser in possession of most of the information which would be obtained by an actual visit. Further, a knowledge of the characteristics of the principal soil types of an area will enable the adviser to recognize abnormalities in individual soils.

The soil map should form the basis for field experimental work. Too often in the past, such experiments have been located on unrepresentative soils, whilst it has even happened that an experiment has been spread over more than one kind of soil. Adequately replicated plot trials are costly to carry out, and it is highly desirable to ensure that their significance should be as wide as possible. When the soil survey of a province has been completed, it will be possible to decide which are the most important soil series and to arrange for the laying out of experiments in the most advantageous localities.

The information acquired from the soil survey, and from the analysis of the soil samples taken, will generally result in a more accurate knowledge of the manurial requirements of different types of soil. The case of soil sourness suggests itself. There are, undoubtedly, large areas in urgent need of liming, and a soil survey might be expected to indicate the location and extent of such areas and to serve as a basis for the necessary propaganda. At present, even where a large proportion of the area of a district is known to be in need of lime, no widespread recommendation can be made until the distribution of the sour lands is known with reasonable precision.

From time to time there is considerable discussion, often among those least informed, of the possibilities of land reclamation. Whilst most of the waste lands are uncultivated on account of their inherent unsuitability for agriculture, there are large areas of wet land which might be worth improvement, particularly as such lands are generally rich in plant food and only require the proper regulation of their water economy. A soil map would give the necessary information as to the areas most likely to repay for expenditure on drainage, and would show the relationship of the wet lands to the general drainage system of the district, thus facilitating the institution of comprehensive schemes of arterial drainage.

There is another aspect of soil survey work, which, however, mainly concerns suburban districts, namely, its bearing on schemes for housing development. A knowledge of the nature of the soil and, in particular, its drainage conditions, would be of great value in determining the value of particular tracts of land for housing schemes. It is obvious that such schemes should not be developed on areas characterized by impeded drainage conditions.

* * * * * *

MARKETING NOTES

National Mark Eggs.—During May, the output of the National Mark egg packing stations was well maintained, reaching a figure of 31·6 million eggs, of which 23·4 millions were packed under the Mark.

In keeping with market quotations for ungraded home-produced and imported supplies, prices of National Mark eggs of all grades in May remained low. There was a marked lack of demand for eggs of all kinds on the markets, salesmen without exception stating that the trade had been exceptionally slow for the time of the year. The normal seasonal decline in egg production has, however, now commenced, and with shorter supplies a wider price margin between National Mark and other eggs is to be expected.

With the striking developments that have recently taken place in egg marketing in this country, closer attention is being paid to the necessity for securing a high standard of quality. The importance of the testing of eggs for quality by candling is being more widely recognized by egg packers, quite apart from National Mark packers, who are, of course, required to use this test of quality.

The Ministry has accordingly prepared an illustrated leaflet (Marketing Leaflet No. 28, *The Testing of Eggs for Quality*) which should be of service, not only to candling operators at National Mark packing-stations, but also to egg producers generally. The leaflet deals with the practice of candling, the formation and characteristics of an egg, and common defects in fresh eggs, and contains a practical guide for candlers. Copies of the leaflet may be obtained, free of charge, on application to The Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

National Mark Dressed Poultry.—Five packing-stations are now operating in the scheme, and a further application for enrolment has been received. Supplies of National Mark dressed poultry are now being more widely distributed on the wholesale markets, but a large increase in quantity cannot yet be expected. Favourable comment has appeared in the trade Press concerning the scheme, and it is clear that the distributive trade generally will welcome its development.

National Mark Beef.—There has been no considerable change in the progress of the National Mark scheme with regard to the number of home-killed sides graded and marked in the three

areas—London, Birmingham and Leeds, Bradford and Halifax —during the past month. The weekly average number of sides graded and marked for the London Market during the five weeks ended June 20, 1931, was 3,436 compared with a weekly average of 3,882 for the month of May, 1931. In Birmingham, the weekly averages were 456 and 403 sides, respectively, while for the Leeds, Bradford and Halifax area 1,107 sides were, on the average, graded and marked weekly in the five weeks ended June 20, 1931, compared with an average of 1,039 during May. Smaller numbers must, however, be expected during the summer months.

A new situation has been created in the London wholesale meat market, Smithfield, by the action of a number of senders of Scotch-killed beef in the Aberdeenshire area who have lately ceased to offer their beef for grading and marking by the official meat graders of the Scottish Department of Agriculture. At the same time, a number of Aberdeenshire senders have commenced to mark their beef with private marks that might be mistaken by retail traders and their customers for the mark of National Mark beef. These marks, being applied by the sender of the beef, and not by impartial graders, obviously afford no statutory guarantee of the quality or grade of the beef, such as is given by the Scottish National Mark grades, and the Ministry has taken steps to put retail traders in London on their guard against accepting beef bearing private marks of this character. The action of the Scottish senders is contrary to the wishes both of Scottish beef feeders and also of wholesale meat salesmen in Smithfield market, the great majority of whom are supporters of the National Mark beef scheme ; it does not affect supplies of English (Home-killed) National Mark beef, which are still obtainable as heretofore.

Urgent representations have been made to the Ministry in favour of grading and marking carcasses of Canadian fat cattle imported into this country for slaughter. The position created by the increasing supply of Canadian fresh beef of excellent quality is certainly one of difficulty. This beef could not be marked with the National Mark, but after careful consideration of all the circumstances and after consultation with the National Farmers' Union and other interested parties, the Ministry has agreed that Canadian beef shall be graded and marked at the point of slaughter according to the grades adopted for the National Mark Beef Scheme, but that, in the mark used, the word " Canada " shall be substituted for the map of England and Wales. The operation of this practice and

of the National Mark Beef Scheme generally will be reviewed next autumn.

The Agricultural (Grading and Marking) (Beef) Regulations, 1929, are being amended to give effect to the foregoing decision and also to include the extensions of the "Prime" and "Good" grades referred to in last month's issue of this JOURNAL (p. 287). In addition, for the purpose of the "Prime" grade, immature bulls may be graded according to their conformation, quality and finish as if they were steers.

National Mark Fruit.—The fresh fruit season has now opened and the National Mark will be seen this year on large quantities of apples, pears, tomatoes, cucumbers, strawberries and cherries.

The following additional growers have been authorized in the National Mark Fruit schemes since last season :—

APPLES

Cambs :	W. Allen, Netherleigh, Upwell, Wisbech.
Cornwall :	R. Summerfield, Sladeland, Saltash.
Hants :	F. W. Bowers, The Orchard, Locksheath Park, Park Gate, Southampton.
Hereford :	Sladd Fruit Farm, Putley, Ledbury.
Kent :	M. C. L. Beale, Nashes, Penshurst, Kent.
	Exors. of the late G. Manwaring, Hadlow Stair Farm, Tonbridge.
	Mrs. A. E. Pain, Blackhall Farm, Sevenoaks.
	F. Scott, Westmoor, Rainham.
Norfolk :	R. C. Dennis, Terrington St. John.

PEARS

Kent :	F. Scott, Westmoor, Rainham.
Salop :	E. Nicholls, Weeping Cross, Cross Houses.

TOMATOES

Cambs :	J. W. Fletcher, Stancliffe Nursery, Old Walsoken, Wisbech.
Hants :	W. H. Cole, Sarisbury Court Nurseries, Southampton.
	W. H. A. Matthews, Marwinthy Nurseries, Sarisbury Green.
Hereford :	H. Probert & Son, Hampton Park Nurseries, Hereford.
Herts :	J. Burgess, Strathfinla Nursery, Church Lane, Cheshunt.
	G. C. Mitchell, Halstead Hill, Cheshunt.
	K. Nilsson, Eslov, Churchgate Road, Cheshunt.
	E. H. Short, Windmill Lane, Cheshunt.
	G. M. Smallbone, Shirley, Church Gate, Cheshunt.
Middx :	A. H. Wurr, Malanda Nurseries, Waltham Cross.
Salop :	E. Nicholls, Weeping Cross, Cross Houses.

CUCUMBERS

Essex :	G. H. Lapwood & Sons, Mead View, Old Nazeing Road, Broxbourne.
Herts :	C. W. Payne & Sons, The Cottage, College Road, Cheshunt.
Middx :	A. H. Wurr, Malanda Nurseries, Waltham Cross.

STRAWBERRIES

Cambs :	W. Allen, Netherleigh, Upwell, Wisbech. Ayers & Son, Elm, Wisbech. J. Gilroy & Sons (Wisbech), Ltd., North Brink, Wisbech. Hickman & Co. (Wisbech), Ltd., Leverington, Wisbech.
Cornwall :	C. Herring, Woodland, St. Mellion. J. R. Hoskin, Cotchele Quay, St. Dominic, Callington. W. J. Martin, Heathfield, St. Mellion. S. Preston, The Bungalow, Landrake, St. Germans. A. Rickard, Brentswood, St. Mellion. F. Rogers, Pitt Meadow, St. Dominic.
Devon :	W. G. Parkin, The Glade, Seaside, Combe Martin.
Essex :	R. J. Cullen, Clarks Farm, Kelvedon. E. H. Streeten, Broadfield Poultry Farm, Tiptree.
Hants :	A. C. Biles, Binstead, near Alton. F. Brooks, The Elms, Binsted, near Alton. G. L. G. Churcher, Woodlands, Locks Road, Lockshealth. G. Harris, North Boarhunt, Fareham. Hartley Bros., Weavils Fruit Farm, Fair Oak. W. Knight, South View, Kingsley, Borden. T. D. Norris, The Cottage, Brook, Sarisbury Green, Southampton. R. A. Sims, The Limes, Crescent Road, Locks Heath, Sarisbury.
Kent :	Major J. S. Bennett, Oaken Wood Farm, Wateringbury. P. French, Teynham. Mrs. A. E. Pain, Blackhall Farm, Sevenoaks. A. Worsley, Kirkins Farm, Horsmonden.
Norfolk :	Dennis & Dennick, Terrington St. John. Emneth Horticultural Station, Emneth. H. S. Harrison, Antioch Farm, New Road, Tilney St. Lawrence. Mrs. E. E. South, The Nurseries, Emneth.
Somerset :	J. Day, Gardeners Arms, Cheddar. R. W. S. Hoskins, Redcliff Street, Cheddar. C. L. Jennings, Fernwood, Cheddar. Somerset Agricultural Instruction Committee, Cannington, Bridgwater.
Suffolk :	Bradman, Laws & Co., Westhall, Halesworth. Goodwin & Geater, Ltd., Dairy Farm, Holton, Halesworth.

CHERRIES

Kent :	W. Brice, Mockbeggar, Higham. Campkin Bros., Cherry Orchard, Hartley, Kent. P. French, Teynham, Kent. Exors. of the late G. Manwaring, Hadlow Stair Farm, Tonbridge. F. Scott, Westmoor, Rainham, Kent. J. Thomas, Nouds Farm, Teynham, Kent. A. Worsley, Kirkins Farm, Horsmonden.
Worcs :	F. P. & C. P. Norbury, Sherridge, near Malvern.

National Mark Canned Fruit and Vegetables.—The increasing interest of fruit and vegetable canners in the scheme is shown by the number of applications for enrolment that have been

received during the past few weeks. Some are from old-established firms who have previously engaged in canning, and others from firms occupied in various classes of food manufacture who are taking up the canning of home-grown fruit and vegetables as a new enterprise. Enrolment in the scheme is dependent upon the applicant being able to satisfy the National Mark Canned Fruit Trade Committee as to the efficiency of his machinery and methods and the quality of his products. The following additional firms have recently received certificates of authorization :—

A. W. Foster & Co., Ltd., "Wrinkleville" Pea Mills, Lincoln.
Wm. P. Hartley (London and Aintree), Ltd., Green Walk, Tower Bridge Road, London, S.E. 1, and Aintree, Liverpool.
The "Silverpan" Preserving Co., Ltd., Reddish, Stockport.

It has been decided to add sliced runner beans, and also two additional varieties of peas—viz., Thomas Laxton and Sharpe's Standard—to the list of vegetables that may be canned for sale under the National Mark.

Information, which should be of value to fruit and vegetable canners, distributors and retailers, regarding the home canning industry and especially the trade in National Mark canned produce is being given in the recently instituted "Weekly Canned Fruit Notes," which provide a weekly intelligence service serving the whole trade in canned fruit and vegetables as well as dried fruit. The "Notes" are published by the Empire Marketing Board.

National Mark Cider.—Ten further certificates of authorization have been issued to the following approved packers, those marked with an asterisk being bottlers :—

*John Grundy (Stockport), Ltd., Stockport, Cheshire.
*H. Gould, Ltd., Battersea, London, S.W. 11.
*The Springwell British Table Water Co., Ltd., Rickmansworth, Herts.
H. Knight, Huntley, Gloucester.
Pullin Bros., Compton Greenfield, near Bristol.
Dorset Farm Cider Makers' Federation, Ltd., Bridport, Dorset.
F. H. Rea, Wootton-under-Edge, Glos.
Henley & Sons Cyder Co., Ltd., Newton Abbott, S. Devon.
John Symons & Co., Ltd., Totnes, Devon.
W. S. Robbins & Son, Stroud, Glos.

The total number of packers authorized under the scheme is now 43, consisting of 31 manufacturers and farm cider makers, 2 associations of farm cider makers and 10 bottlers. Applications for enrolment in the scheme are steadily coming in, and several are under consideration.

National Mark Wheat Flour.—The following additional firms have become enrolled in the Scheme as authorized re-packers :—

E. Bloomfield & Son, Hadleigh, Suffolk.
N. Cakebread, 1 The Avenue, Highams Park, E. 4.
C. D. Chadband, 12 Swan Street, Warwick.
Thos. Clarke & Co. (Tea Dealers), Ltd., 2 George Lane, E.C. 3.
A. J. Coombes, Chilton Polden, Somerset.
Ernest Davies, Criterion Bakery, Dolgelley, Merioneth.
Dominion Stores, 25 and 26 Cromwell Street, Swindon, Wilts.
Dumpers, Ltd., High Street, Winchester.
Harry A. Hall, Arlesford, Hants.
The Haymarket Stores, London, S.W. 1.
S. S. Lingford & Co., Bishops Auckland, Durham.
A. Newbery, Lyme Street Bakery, Axminster, Devon.
W. T. Newman, Barrellsdown, Bishop's Stortford, Herts.
A. G. Page & Sons, Penhill Bakery, Lancing, Sussex.
John Scott & Co., 225 High Street, Lincoln.
R. Seely & Sons, Bailgate, Lincoln.

The following firms have been enrolled as authorized millers:—

Wm. Green & Sons, Brantham, Suffolk.
E. J. Coombe, Ltd., Thorverton, Devon.
Lincoln Co-operative Society, Ltd., Flour Mill, Montague Street, Lincoln.

Publicity for National Mark Produce.—Local publicity was undertaken in conjunction with the Ministry's marketing demonstrations at the following Agricultural Shows : Royal Counties, Portsmouth (June 3–6) ; Three Counties, Hereford (June 9–11) ; Royal Norfolk, Great Yarmouth (June 17–18) ; and Lincolnshire, Lincoln (June 24–26). In each case, hoarding-poster displays and Press advertising were arranged. The principal feature of the activities organized by the respective local traders' organizations was a shop-window display competition open to retailers stocking National Mark products. In connexion with the Ministry's occupancy of the Empire Shop, 61 High Street, Birmingham, during the first fortnight in June, National Mark products were advertised on local hoardings throughout the month, and also in the Corporation trams, while various minor activities, including a National Mark egg recipe competition, were arranged.

During June, advertisements of National Mark beef, cider and fruit were inserted in trade journals, and the series of advertisements in women's journals—referred to in the May issue of this JOURNAL—was continued.

At the forthcoming Confectioners', Bakers' and Allied Traders' Exhibition, to be held at the Royal Agricultural Hall, Islington, September 5–11, the Ministry is offering three prizes of 20 guineas, 10 guineas and 5 guineas, respectively, for the best 2-lb. Commercial Tin Loaf made wholly with All-English National Mark flour. Competitors must give a

guarantee that the bread is made wholly from All-English National Mark flour and that none of the other ingredients (yeast, etc.) is of foreign origin. The Ministry is also offering gold, silver and bronze medals, as well as diplomas, for the three best entries in a new class in the British Wheat Flour Competition at the Exhibition, open only to authorized millers of National Mark All-English (Yeoman) flour, and a gold medal to the farmer providing the largest proportion of the wheat used in the winning flour. The flour must be milled solely from Yeoman wheat grown in England and Wales and must comply with the standards of quality required for All-English (Yeoman) flour packed under the National Mark. Entries must consist of 3 bags of flour of 7 lb. each ; one 2-lb. bag of the wheat used must be sent in. The National Farmers' Union is offering three prizes of £10, £5 and £3, respectively, for the best 1-lb. All-English Commercial Milk Loaf (tin) made from National Mark flour.

An important feature of the Ministry's publicity is the circularization from time to time of wholesale and retail traders, public institutions, hospitals, hotels, clubs, colleges and other large consumers, as well as individual housewives, with a view to enlisting their practical co-operation in extending the influence of the National Mark scheme. The following circular letter was recently addressed to Headmasters and Headmistresses of Public and Secondary Schools in England and Wales :—

S.C. 10603/C.L. *June* 19, 1931.

CIRCULAR LETTER TO HEADMASTERS AND HEADMISTRESSES OF PUBLIC AND SECONDARY SCHOOLS IN ENGLAND AND WALES

DEAR SIR OR MADAM,

You have doubtless read references in the Press and elsewhere to the National Mark Scheme, which has been established by the Minister of Agriculture and Fisheries as a means of increasing the demand for home-grown produce through a better and more up-to-date marketing service, thereby giving a much-needed stimulus to the agricultural industry in England and Wales.

The aims and methods of the Scheme are explained in the enclosed booklet, " The National Mark," which also contains a list of the commodities which up to the present have been brought within its scope. The principle of standardization embodied in the Scheme is accepted by all political parties as a desirable feature of any programme for improving the marketing of home agricultural products, and successive Governments have shared in the development of this movement.

The factor of physical health is one that enters largely into modern educational systems, and the importance of wholesome and nutritious food in building up and maintaining a sound physique is generally recognized. Attempts have been made to prove that a population thrives best on the produce of its own soil, but whether this is the case

or not the fact remains that our farmlands and orchards produce food which is unrivalled for flavour, freshness and nutritive qualities.

The use of the National Mark on or in connexion with any commodity conveys, in effect, a warranty that the quality of the produce is of the grade stated, and the Mark is, therefore, a valuable safeguard to the consumer, providing as it does a guarantee both of home origin and dependable quality.

The National Mark operates in the direction of assisting English agriculture to withstand increasing competition from abroad and of helping to reduce the volume of unemployment in the rural areas due to the difficult times through which the agricultural industry, in common with other great staple industries, has been passing in the post-War years.

The Minister, therefore, hopes that Headmasters and Headmistresses will recognize the merits of the National Mark Scheme, and will actively assist in forwarding this movement by stipulating National Mark products, whenever possible, in their catering requirements. Supplies are obtainable through the usual wholesale and retail trade channels, but the Ministry will be happy to assist in cases of difficulty.

The Ministry will also be pleased to supply copies of the National Mark Booklet if desired and to arrange lectures, illustrated with films in suitable cases, in order to explain the scheme.

Yours faithfully,

(Sgd.) A. W. STREET.

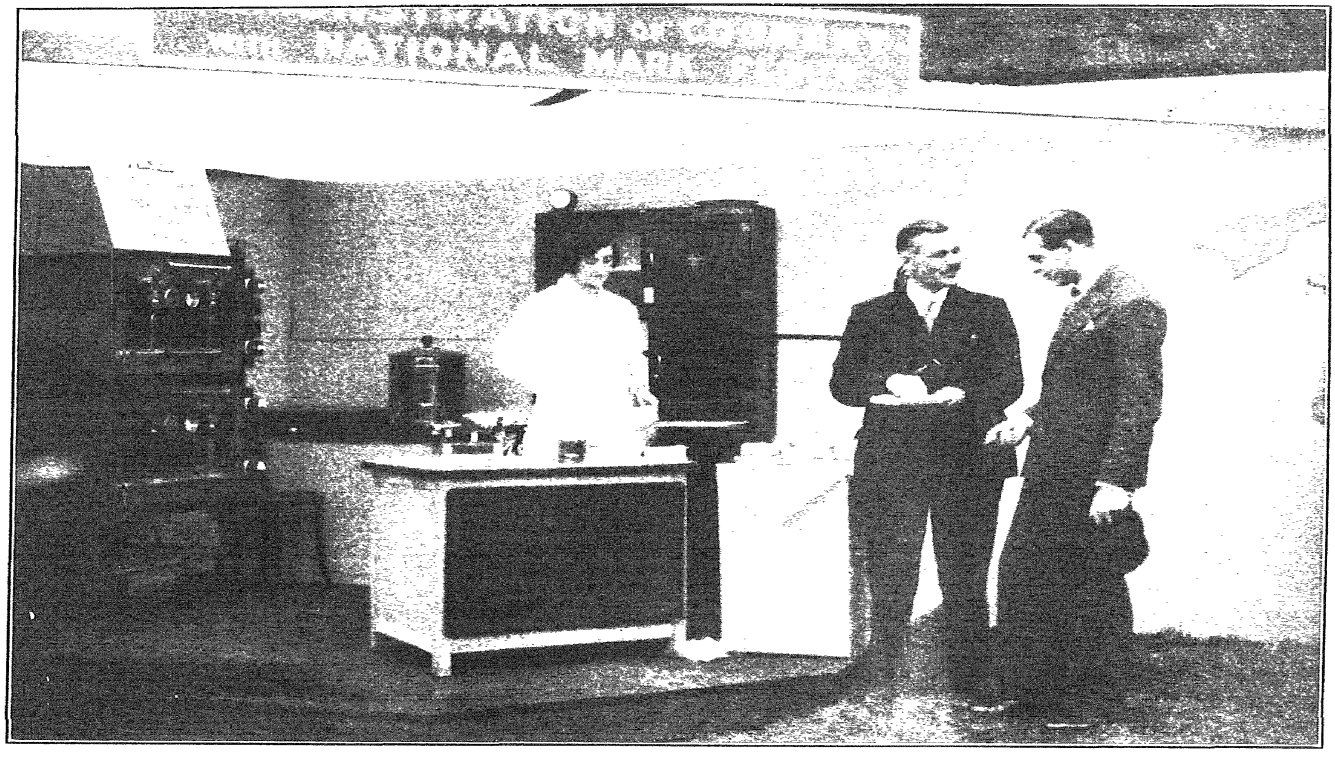
Displays of National Mark and other Home Produce.—The concluding period of the Empire Marketing Board's tenancy of the Empire Shop at 61 High Street, Birmingham, commenced on June 1, when the Ministry took possession of the premises for a fortnight's display of National Mark produce. One of the windows, which was devoted to a display of National Mark cider, is illustrated opposite. The opening ceremony was performed by Sir William Crawford, K.B.E., in conjunction with the Lord Mayor of Birmingham. All National Mark products in season were displayed and samples were on sale. A portion of the premises was devoted to a working demonstration of the grading and packing of eggs under the National Mark scheme. National Mark products were used in the demonstration kitchen. Considering that the shop had been running since last January with fortnightly changes of occupation, the interest of the general public of Birmingham in the venture was remarkably well maintained.

A generous offer of the tenancy of shop premises in the heart of the West End of London (situated at the corner of Burlington Gardens and Cork Street) for a period of two months for an exhibition of National Mark produce has been accepted by the Ministry. The exhibition was opened on June 24 by Lady Desborough. Earl De La Warr, Parliamentary Secretary to the Ministry, presided over a very representative

(face page 304.



Display of National Mark Cider in the Empire Shop, 61 High Street, Birmingham.



H.R.H. Prince George inspecting the Cookery Demonstration in the Ministry's Pavilion at the Royal Counties Show, Portsmouth.

company which displayed keen interest in the egg-grading demonstration and other exhibits.

A display of home produce was staged at the Glasgow Empire Exhibition held in the Kelvin Hall, Glasgow, from May 29 to June 13.

Marketing Demonstrations.—Marketing demonstrations covering honey and cheese and displays of National Mark produce were staged at the following agricultural shows during June :—

Royal Counties Show, Portsmouth, June 3-6.
Three Counties Show, Hereford, June 9-11.
Royal Norfolk Show, Yarmouth, June 17-18.
Lincolnshire Show, Lincoln, June 24-26.
Peterborough Show, Peterborough, June 30-July 2.

The first-named show was honoured with a visit on June 5 by H.R.H. Prince George, who visited the Ministry's stand and showed a lively interest in the National Mark exhibit. A photograph of His Royal Highness at the Cookery Demonstration in the Ministry's pavilion is reproduced opposite.

Marketing demonstrations are being given at the following shows during July :—

Royal Agricultural Society of England Show, Warwick, July 7-11.
Great Yorkshire Show, Huddersfield, July 14-16.
Royal Welsh Show, Llanelly, July 22-24.
Royal Lancashire Show, Liverpool, July 30-August 3.

A fruit marketing demonstration will also be given at the Kent County Show at Canterbury, July 15–17.

The Sugar-Beet Industry at Home and Abroad.—With the exception of a four years' break from 1916 to 1919, sugar-beet has now been grown in Great Britain, on a commercial scale, continuously since 1912. The establishment of a subsidy on sugar manufactured from home-grown beet under the British Sugar (Subsidy) Act, 1925, gave a much-needed degree of security to the factory side of the industry, and since that date rapid progress has been made. Sugar beet cultivation in Great Britain reached its maximum in 1930, when almost 350,000 acres were grown. The industry is now, however, entering upon what appears to be its most critical phase. While sugar prices have fallen during the past 12 months to an abnormally low level, the rate of subsidy falls this year to its lowest level of 6*s.* 6*d.* per cwt. of sugar and will cease altogether in 1934.

In these circumstances, the latest addition to the Ministry's Economic Series of Reports, namely, a "Report on the Sugar-

Beet Industry at Home and Abroad,"* which has just been published, will be of particular interest. This Report covers every aspect of the industry in this country and includes many valuable comparisons with conditions abroad. It is profusely illustrated. In its preparation, Mr. Alfred Wood, as representing the industry, has, at the invitation of the Ministry, co-operated with Mr. J. H. Gorvin, C.B.E., of the Markets Division of the Ministry. Mr. B. A. Forster, of Messrs. Czarnikow of Mincing Lane, a Director of the Anglo-Scottish group of beet-sugar factories, has assisted them in a consultative capacity.

The Report opens with a brief survey of world production and consumption of sugar, emphasizing the great expansion in world production since the War. This is followed by a brief history of the growth of the sugar-beet industry on the Continent and in the United States, and a more detailed account of its development in this country.

Then follows a detailed consideration of the agricultural aspects of the industry. The technical questions of the production of seed, the cultivation of the crop and the utilization of crowns and leaves are first considered. Emphasis is laid on the great indirect value of the crop to the farmer, apart from its actual cash value as a saleable product, arising from the beneficial effect on the soil of the intensive manuring and cultivation required and from the supply of feeding-stuffs provided by its by-products—the tops left on the field and the pulp from the factory.

The question of the labour requirements of the crop occupies a separate chapter. In this connexion, it is worth noting that during the first six years of the subsidy period some £5½ million are estimated to have been paid out in wages to workers directly employed in sugar-beet growing. On the average, each acre of beet in a year provides work for one man for about four weeks.

In the agricultural section of the Report, valuable statistics are given, for this and other countries, of acreage, yields per acre, sugar-content and total production, as well as average costs of growing the crop on a number of farms throughout the country.

A unique feature of the industry in this country is the organized system of research into the agricultural problems of beet growing and of education of the growers that has been

* Economic Series No. 27. H.M. Stationery Office, price 6*d.* net, post free, 1*s.*

arranged in past years by the Ministry in conjunction with the Committee representing the factories. This system is described and the principal lines of research are indicated.

After a description of the methods employed in transporting beets from field to factory and in determining net weight and sugar-content—important considerations to the grower since they form the basis of the price that he receives—the Report proceeds to deal with the manufacturing side of the industry. The process of white sugar manufacture employed in a typical " continuous process " factory is briefly described, and the production and methods of disposal of factory by-products—molasses, beet pulp and lime cake—are discussed. As in the agricultural section of the Report, considerable attention is paid to the subject of labour employed in sugar manufacture. One of the main difficulties of the factory side of the industry is that its operations are highly seasonal and that its heavy season coincides with a busy time on farms in the beet-growing districts so that it is not practicable for the same men to find employment in factories and on farms alternately. Difficulties concerned with the provision of continuous employment, and with other economic problems arising out of the seasonal character of production, have been partly solved by some of the beet-sugar factories by engaging in the refining of imported raw sugar in the off-season.

Complete statistical and financial data with respect to sugar production in this country are given in a separate chapter, which includes, *inter alia,* figures showing the average costs of beet-sugar manufacture in this country based on information voluntarily supplied by all the factories. A reduction of almost 50 per cent. in the cost per cwt. of sugar manufactured has been effected since the first years of the subsidy period.

The industrial section of the Report concludes with a consideration of education and research in connexion with factory operations—in particular, the problem of effluent disposal—and with a description of the transport of sugar and factory materials and by-products.

The last section of the Report covers the subjects of sugar taxation and State assistance to the industry, the marketing of sugar, the course of sugar prices, and the prices obtained by the growers for their beets since the establishment of the industry in this country.

In the concluding chapter, the progress and prospects of the industry in this country are reviewed. It is pointed out that the results obtained fully prove the suitability of the crop

to soil and climatic conditions in this country. The crop has important national advantages, both agriculturally and as a source of employment. The technical progress made both by the growers and the factories may be regarded as satisfactory, though beet yields here as compared with those obtained abroad still leave something to be desired. The average returns obtained by growers per acre of the crop and by factories on the capital invested have fluctuated from year to year, but up to the 1930-31 season had on the whole not materially diminished. The cost of the industry to the State in the form of subsidy and rebate of taxation has amounted to over £29 million in the seven years of the subsidy period to date; the object of this expenditure is, of course, that of enabling a nationally valuable industry to become permanently established. The critical position in which the industry at present finds itself as a result of this year's drop in subsidy and the low level of sugar prices has been eased, after the breakdown of price negotiations between the growers and the factories, by the granting, subject to the approval of Parliament, of a special advance to the industry for 1931-32, details of which are set out in the Report. Growers, however, have had to accept lower prices and factories to make parallel sacrifices.

It is possible that the recent restrictive measures taken by the principal sugar-exporting countries under the Chadbourne Plan (also described in the Report) may make things easier for the industry in future years, but the entire cessation of the subsidy in 1934 has also to be prepared for. The Report suggests that "the best hope for the future lies in the unification either of the home-grown sugar interests, as such, working side by side and in harmony with the refining interests, which have already attained a high degree of unification, or of all sugar interests in this country, both manufacturing and refining, accompanied by satisfactory safeguards for the sugar-beet grower. It would then be a question for consideration whether in negotiating beet prices any advantage would be gained by replacing the method of collective bargaining, which has previously been adopted and is only concerned with price-fixing, by a more compact system of collective purchase and sale, in which the contracting parties would be an all-in combination of factories on the one side and an all-in marketing organization of beet growers on the other."

Marketing of Fruit Act (Northern Ireland), 1931.—On May 26, 1931, the Royal Assent was given to this measure for the

control of persons engaged in the export of fruit from Northern Ireland to Great Britain, the Irish Free State and the Isle of Man, and for the establishment and maintenance of standards of quality for fruit grown in Northern Ireland. The Act applies to apples, pears, plums, cherries, currants, gooseberries, raspberries, strawberries, loganberries and such other fruits as may be prescribed.

Part I of the Act, which follows very closely the lines of recent Northern Ireland legislation dealing with potatoes and dairy produce, deals with exports of fruit to Great Britain, the Irish Free State and the Isle of Man, and requires that these shall be by licence or permit and that fruit for export under licence shall be graded, packed and marked as may be prescribed. Permits (which do not involve the regulation of grade and pack) may be granted in respect of fruit grown by the consignor and of fruit consigned for bottling, canning, or processing, or for experimental or other exceptional purposes. In all other circumstances, licences are required, though this part of the Act does not apply to re-exports, to small consignments not exceeding weights that may be prescribed, or to fruit consigned to the Irish Free State and not to be re-exported to Great Britain or the Isle of Man.

Part II of the Act deals with the sale of Northern Irish fruit in Northern Ireland and provides for the prescription of voluntary grade designations and grade designation marks to be used only by duly authorized persons. The practice of "topping" is prohibited, and provision is included for the making of rules to control the material and capacity of containers of fruit sold or offered for sale to a retailer for resale by him.

The general provisions in Part III of the Act empower the Minister of Agriculture to make rules. The Minister is to appoint an advisory committee to advise the Department in this connexion and each House of Parliament is to have an opportunity to annul any such rules by resolution within a specified period.

National Mark for Hungarian Lard.—Exports of bacon and lard from Hungary amounted in 1929 to 68,000 cwt., and in 1930 to 165,000 cwt. As exports of bacon are very small compared with those of lard, and as the pig population decreased from 2,582,000 in 1929 to 2,362,000 in 1930, the increase in the exports of lard is justifiably attributed to the effect of the Standardization Order of November 7, 1929.

The Order lays down that the official mark for Hungarian lard may be used only by firms that are permitted to trade in lard under the existing law, and that have been given permission by the Export Institute to use the Mark. The authorized firms, of which a special register is kept, purchase the necessary supply of Mark labels from the Export Institute. They are required to keep an exact account of their use. To qualify for the application of the National Mark, produce must come up to certain minimum standards that apply to :—

(1) the place of manufacture and the methods of production ;
(2) the produce itself ;
(3) the packing of the product.

The place of manufacture must be properly arranged and equipped and must be under expert management. All the rooms, as well as the melting boiler, the clarifier and the stirring sticks, must be kept scrupulously clean. No tallow, margarine, vegetable fats or other substances that might serve for adulteration may be kept on the premises, either in a crude or in a melted condition. The manufacturing process must be approved by the Institute, which insists upon certain temperatures and specified methods of melting, clarification and cooling.

The lard must be produced from pure, raw, odourless pig's fat, without the addition of any foreign substance. It must be of the proper white colour, and may not contain more than 0·3 per cent. of water, 0·2 per cent. of meat tissue and 1·5 per cent. of acid.

For packing Mark lard, boxes, barrels and tubs may be used.

(*a*) Boxes must be made of planed odourless board, in the sizes that have been introduced abroad. No variation from the gross or net weight is permitted. Every box must contain 25 kg. of lard in 1, 2, 5 or 25 pieces. In packing for the home trade, wrappers of parchment paper must be used.

(*b*) Barrels must be made of oak, and must be new and of first-class quality. Before use, they must be thoroughly washed and dried. They may contain a net weight of 50, 80, 90-100 or 190-200 kg. of lard ; to meet the requirements of foreign trade, other sizes may be allowed. For the home trade, parchment paper wrapping is required.

(*c*) Tubs are not yet standardized, but the Export Institute may, if necessary, issue regulations with regard to them.

The National Mark is applied in two ways. A gummed label, partly printed in green, is stuck on the top of the package, and another thin and ungummed label printed in black is affixed to the upper surface of the lard immediately after it has solidified. Mark labels are applied to the packages after samples have passed the required tests.

An inspection service is carried out by the Export Institute. Inspection extends to the equipment, production processes and records of the factories, and also to the finished goods, including methods of packing and storage. Inspected and labelled goods must be exported within 14 days. Mark lard may only be stored in a place that is suitably cool, clean and free from smells.

The inspection service is free. Charges are made only for the labels in order to cover expenses. Infringements of the standardization regulations are punishable by the withdrawal of the right to use the National Mark, and also by fines and other penalties.

Hungarian Standardization Act.—The Hungarian Standardization Act of January 22, 1931, is an enabling Act that aims at the setting up of national marks and embodies many features of the National Mark system that is being operated in Great Britain under the Agricultural Produce (Grading and Marking) Act, 1928. It empowers the Hungarian Minister of Agriculture :—

(1) To determine by decree, after consultation with the representatives of agriculture and trade, the products to be standardized, the standardization regulations governing grading, etc., and the time of their coming into force.
(2) To grant to applicants the right to use the national mark.
(3) To order the use of the national mark, after consultation with the representatives of agriculture and trade, not only for export produce, but, where justified, for produce for home consumption as well.
(4) To make a charge for the mark labels issued, which, however, may not be greater than 2 per cent. of the value of the goods marked.
(5) To exercise measures of control over the mark. The method of inspection is to be determined by decree in agreement with the Minister of Trade. Inspection will be attested by the application of the Export Institute's stamp to the mark label.

The form and size of the national mark are exactly defined and apply to all products. The mark is about 12 cm. in diameter, and in addition to the national emblem (the Holy Hungarian Crown) it contains the following :—

(1) The words " State Produce Mark."
(2) The word " Hungary."
(3) Statement of the kind of goods and, where required, their quality.
(4) The serial number of the firm authorized to use the mark.
(5) The serial number of the package.

The inscription can be in foreign languages as well as in Hungarian. Where necessary, the Minister of Agriculture may also permit the use of control labels differing from the officia

mark. The national mark labels are produced at the order of the Minister of Agriculture, and the administration and distribution are done by an officer appointed by the Minister. Persons authorized to apply the mark are required to keep an exact account of their use of the national mark labels.

Severe penalties are specified in great detail in the Act. Infringements are punishable by imprisonment up to three years, by loss of civil rights, and other penalties. Offences committed against the Standardization Act abroad are also punishable in the same way.

For some years Hungary has had State control-marks for butter, lard (see note above), paprika, clover seed and lucerne seed. The present Act is to extend standardization to other agricultural products. The first will probably be eggs and grain.

Producer-Manufacturer Agreement in the Roquefort Cheese Industry.—The rationalization of the manufacturing side of the Roquefort cheese industry was briefly described in the Ministry's Orange Book on Cheese Marketing* issued towards the end of last year. A further interesting development, according to an article in *Le Lait* (April, 1931), is the conclusion of an agreement between the representative associations of the ewe-keepers and the Roquefort manufacturers, as a result of which a joint organization of the ewes'-milk producers and the Roquefort manufacturers has been formed.

This step is of considerable importance in view of the extent of the Roquefort cheese industry, which is the chief source of revenue for some 25,000 agricultural holdings throughout 10 Departments of France, and employs about 30,000 wage-earning shepherds and milkers. About 12,000 tons of branded cheese are produced each year from the Roquefort caves, approximately half being exported. This represents a turnover of 200 million francs (£1,600,000), or about 300 million francs (£2,400,000) if the turnover of subsidiary industries is included.

The objects of the long negotiations preceding the agreement were, on the one hand, to guarantee milk producers a basic price sufficient to cover their expenses and provide a fair return for their labour and also to secure for them a fair share in the profits from the sale of Roquefort cheese; and, on the other hand, to relieve the manufacturing side of the industry of all anxiety as to regular supplies in respect of both quantity and quality of milk, so that its whole effort could be devoted to organizing and improving the sale of the cheese, principally abroad, to the benefit of the industry as a whole.

* *Report on the Marketing of Dairy Produce in England and Wales, Part I, Cheese*, pp. 106 and 107.

There are three main clauses to the agreement. (1) The first deals with steps for standardizing the quality of the cheese. (2) The second relates to the fixing of a basic price for milk—a difficult matter—and the rate of remuneration of the manufacturer. (3) The third determines the method of distributing between the manufacturers and the producers the net annual proceeds of cheese sales; this again is a difficult matter.

(1) To secure the standardization of the quality of the cheese, a general inspection service is established jointly by the milk-producers' and manufacturers' interests for the purposes of supervising producers' deliveries of milk, of keeping a check upon cheese-making in the dairies, upon the origin of cheese brought into Roquefort and upon the ripening processes in the caves, and of putting a stop to fraud and wrongful use or imitation of labels. The service will be operated by a Joint Committee, whose expenses will be covered by a levy of 1 franc per 100 kilos of cheese.

(2) The arrangement regarding milk prices and manufacturers' returns distinguishes between the costs of production of producers and manufacturers. The producer will receive 830 francs per 100 kilos of cheese to cover his basic expenses; the manufacturer will receive 5 per cent. of the selling price per 100 kilos of cheese as the return on his fixed capital and as payment for his manufacturing operations.

(3) After deducting the expenses jointly incurred and the amounts required for the minimum returns to producers and manufacturers, the net profit on the cheese sales of the whole industry will be distributed in such proportions as will reward, first, efficiency among producers and, secondly, enterprise among manufacturers. The proportion of the profits received by each producer is based on the number of litres of his milk that are required to manufacture 100 kilos of cheese.

The Joint Committee will always know the selling price of cheese and consequently will be able not only to guarantee the good faith of the transactions, but also, when occasion arises, to provide producers with reliable forecasts of variations in milk prices.

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COUNCIL OF AGRICULTURE FOR ENGLAND

THE Thirty-Sixth Meeting of the Council was held on Thursday, June 11, at the Middlesex Guildhall, Westminster. *Lord De La Warr*, Parliamentary Secretary of the Ministry of Agriculture, and *Sir Charles Howell Thomas, K.C.B., C.M.G.*, Permanent Secretary, attended. *Mr. James Hamilton* (Lancs) was proposed as Chairman for the year by Mr. Clement Smith (East Suffolk). The motion was duly seconded and carried unanimously. The thanks of the Council were given to the retiring Chairman, *Mr. Denton Woodhead*, who suitably replied.

Lord De La Warr said that the Minister, unfortunately, was unable to attend the Council Meeting through his engagement with the House of Commons Standing Committee on the Licensing of Bulls Bill. Arising out of the last Council Minutes, he said that the Ministry had sent a Circular Letter to Local Authorities on the question of prosecutions under the Fertilizers and Feeding Stuffs Act, as had been suggested by the Council. As regards the Warble Fly experiments, the Ministry had agreed to a Circular to Agricultural Committees informing them of the terms of the Council's resolution and inviting them to carry out further work or experiments in dealing with the pest. *Sir Arthur Hazlerigg, Bart.* (Leicester), asked whether action had been taken on the Council's suggestions in their Report on the Grading of Milk for Sale. *The Parliamentary Secretary* replied that the Ministry of Health had been considering the matter in conjunction with the other Departments, and it was hoped within the next month or so to be able to make an announcement on the subject. He said that it was not for him to anticipate any decisions that may be come to, but he would ask the Council to realize that the Ministry might need its support if it came to the question of altering existing grade designations. At the same time, a decision would be taken only after the closest consultation with the interests concerned. *Brig.-Gen. H. Clifton Brown, M.P.* (West Sussex), asked whether, before the Government came to any decision, the Standing Committee of the Council could also be consulted. *Lord De La Warr* promised to put that point before the Minister.

Marketing of Home-Produced Honey.—*Sir Arthur Hazlerigg*, Chairman of the Standing Committee, moved the adoption of the Report on the Marketing of Home-Produced Honey. (*See* Appendix I, p. 414.) He said that there was a great

diversity of experience and of views among expert bee-keepers, and it had not been an easy task for the Committee to get out a Report which would properly cover the limited subject of marketing. Honey was an important product and in need of advertising, because the total consumption of honey in this country was at the moment only ¼ lb. per head per annum. Home-produced honey was more valuable than imported honey, and it was up to the producers to see to it that their commodity was properly marketed. The National Mark would be a great help when it could be adopted for this commodity. Schoolmasters and Young Farmers' Clubs were useful propagandists and were teachers of the next generation of bee-keepers. Sir Arthur referred to the Ministry's Report on the Marketing of Honey and Beeswax, Economic Series No. 28, which he said gave the industry a thorough basis to work upon. *Sir Walter Berry, K.B.E.*, drew attention to the value of bees as a means of fertilizing fruit trees. He thought this was as important as honey production. *Mr. A. E. Bryant* (Bucks) thanked the Standing Committee for the Report and said that the shopkeepers who bought home-produced honey were accustomed to playing off the cheap foreign honey against the home-produced when it came to fixing a price for the former. After further discussion, the Report was adopted by the Council.

Law relating to the Sale of Milk.—*Mr. Clement Smith* moved the adoption of the Report on behalf of the Standing Committee. He said he thought that all parties were agreed that the present law relating to the sale of milk was unsatisfactory. It was unsatisfactory from the point of view of the producer and of the general public. The Report did not wish to defend those who wilfully and deliberately adulterated milk, either by the addition of anything to it or the subtraction of anything from it. He invited the Council to ask the Ministry of Agriculture to forward the Report on to the Ministry of Health for its consideration.

Mr. C. H. Roberts (Cumb) said he would like to thank the Standing Committee for their very effective reply to the Ministry of Health. They had been very courteous, he thought, in the circumstances. In his view, the Minister of Health's attitude implied an unjustified and unwarranted slur on milk producers. He had stuck obstinately to the view that when milk fell below certain specified percentages—a matter beyond the milk producer's control—the producers had been guilty of fraud. Would he sit down under such a slur ?

The Minister of Health seemed to think that a system of proper feeding would be an absolute guarantee of milk up to the minimum legal standard. Would he provide them with that system of feeding? As a matter of fact, it would be impossible for him to do it. The Standing Committee proposed to impose penalties on wilful adulterators, and to put the question of poor quality milk into the Civil Courts. Where the cow defaulted, the question would be one for the Civil Courts; where the man attempted fraud, the question would be one for the Criminal Courts. The present law must lead to unjust convictions. *Brig.-Gen. Clifton Brown* said that, for the last 12 years, every Committee on the subject had found themselves up against the Ministry of Health in this matter. He urged the Council to go on with its objections. The present Minister of Agriculture had been Minister of Health and, therefore, should know both sides. *Mr. H. W. Thomas* (Hants) agreed with the Standing Committee's Report and wished to reinforce Mr. Robert's contention. In Hampshire, when the farm school ran short of milk they got it from a neighbouring farm and found it deficient not in butter fat but in milk solids. An endeavour had been made to increase the milk solids by feeding, but it could not be done on that particular farm. The conclusion had been arrived at that the land was deficient and that milk up to standard could not, therefore, be produced from it.

Dr. Chas. Crowther said that, from the point of view of the scientific advisory side, the whole difficulty of the different methods of attempting to control the sale of milk arose in the application of fixed standards to the diagnosis of a product of extremely variable composition, due to a variety of causes over which the farmer had absolutely no control. No system of that kind could possibly avoid the most flagrant injustices. Moreover, there was a general failure amongst those responsible for the administration of the law to realize that the analyst could only diagnose the poverty in milk, but could not discriminate with any certainty between honest poverty and dishonest poverty. Variations in butter fat content could be controlled to some extent. Many factors of variation were now understood. The great majority of cases brought before the Courts were not cases of deficiency of butter fat, but of water addition to milk, and that was diagnosed primarily by the percentage of non-fatty solids. It was just there where the scientific people were hopelessly in the dark as to the causes of variation in non-fatty solids.

He could not advise farmers how to get over the difficulty. The only way was to reserve deficient milk for calf-rearing and not let it go into the public supply. No sort of feeding of cows that he knew of could get rid of the difficulty. He had always thought, and he had made the suggestion 20 years ago, that the proper method of dealing with the injustice was the one embodied in the Report of the Standing Committee, namely, that the whole business of the sale of milk, apart from adulteration, should be taken out of the Criminal Court and put on the basis of a civil contract between supplier and consumer. Compensation to a purchaser for deficiency of milk under the terms of a private contract was a very different thing from deficiency on which a criminal charge could, entirely unjustly, be based.

Mr. W. Holmes said that it was a very important thing that milk should be kept up to standard. In his view, the standard under the Act was already rather low. He did not think anything should be done which would put milk on a different plane which would cause it to be less rigorously dealt with than at present. *A Member* asked whether the speaker was referring to foreign milk or to all milk. *Mr. Holmes* replied that he was referring to all milk. *Sir Arthur Hazlerigg* said he must protest against the very scandalous suggestion that the recommendations in the Report would, if carried out, lower the quality of milk. He did not think that Mr. Holmes could have read the Report fully, and he hoped that no one would go away with the idea that the Standing Committee were suggesting a lower standard of milk. The suggestion was that the law be altered to deal more justly with the farmer. The Report was then adopted.

National Mark Progress.—*Mr. Cecil Robinson* (Holland) presented the Report of the Standing Committee on Progress under National Mark Schemes. He said that, as a practical grower, he was very much in favour of the National Mark Schemes. They enabled the grower to grade his produce better, and Mr. Robinson could assure the Council that for any extra expense and trouble to which the grower might be put, his returns amply repaid him. It was certainly an advantage to consumers to know exactly what quality of produce they were buying. A great deal could be done for the schemes by advertising, and he hoped that the Empire Marketing Board and the B.B.C. would assist in this direction. Mr. Robinson referred to the details of egg-marketing, and said, as regards

broccoli or cauliflower, that the effort to sell these abroad under the National Mark had been a very useful enterprise as an example to growers of what could be done. During the last few months, 35,000 tons of cauliflower had been imported into England. This, he thought, could be avoided. He expected that there would be millions of cans of fresh peas turned out from the new canning factories this year. *Mr. Bryant* called attention to the scheme for the marketing of eggs. He said that packing stations in Bucks were closing down, better prices being obtained for eggs in local markets than from the packing stations. He would like to know why that was. *The Parliamentary Secretary* replied that the experience in Bucks, if that were the case, was not universal, otherwise there would not be the increase in packing stations and in the number of eggs passing under the scheme. His advice would be, first, for their packing stations to be better run, and, second, for producers to realize that they had to stick to a new scheme loyally for a period and not accept the bribes of various sections, such as higglers, and so on, who are prepared to offer increased prices for a short time and so side-track the station. He congratulated the Committee on the Report, which was very much welcomed by the Ministry. The Department was glad to receive the assistance and co-operation which it had had from the Council in helping the producer to improved marketing. A Bill was now being prepared with the object of extending the National Mark to certain commodities, such as jam, and with the co-operation of all parties it was hoped to introduce the Bill next week and to get it through Parliament this session.

Lieut.-Colonel Sir Merrik Burrell, Bart., C.B.E. (West Sussex), said he would like to emphasize the point which was put forward prominently in this Report and was contrary to the statements made in certain quarters, viz., that the Council was doing useful work for the good of Agriculture. *Mr. R. Bruford* (Somerset) questioned whether it was really very much good to market produce in a better form and make it worth more money to the housewife, when the housewife could buy cheaper from the foreign market. Dumping must be stopped, if Agriculture was to be helped. *Mr. John Beard* thought that the number of people in the country who knew about the National Mark was quite small. The importance of the scheme certainly had not yet been realized in rural districts. Advertising it should be made a very big question, and it should be brought personally to the notice of

every woman who did the shopping. The Empire Marketing Board was the body which had the money to do it, and the farmers should club together to advertise. *Sir Walter Berry* said it was very difficult where goods were not marked to be sure that one was getting English produce. Inquiring at the railway station as to how much of the produce of a certain creamery was English, in other words, how much butter came into the factory and how much came out, he was told that 80 per cent. of the butter was brought into that creamery by rail. *Sir Douglas Newton, K.B.E., M.P.* (Cambs), agreed that, though the National Mark had made remarkable headway —and he congratulated those associated with it on its progress —everything should be done to advertise it more. He had just returned from one of the world's largest agricultural shows in Hanover, Germany, and had been struck with the prominence given to dairy exhibits. Milk was sold there as chilled, as chocolate milk, and so on, and made into very refreshing drinks. Our dairy produce should be more advertised. *Mr. Cecil Robinson*, replying to the debate, said he agreed very much with Mr. Beard and Sir Douglas Newton. The B.B.C. might give a general talk on the National Mark and the Empire Marketing Board might prepare films for showing in cinemas up and down the country. The public needed educating, and thousands of people to-day, who were buying foreign produce, should insist on buying British. *Lord De La Warr* said that it was not the Ministry's province to say exactly what the B.B.C. should broadcast. The Empire Marketing Board had already voted a large amount of money towards National Mark advertising. It might be a drop in the ocean only, but it was a beginning. The first thing to do under the new Marketing Bill would be to establish Marketing Boards which would be empowered, amongst other things, to undertake advertising.

Preparation of Fruit for Market.—*Mr. George Hewitt* presented the Standing Committee's Report on the Ministry's Report on the Preparation of Fruit for Market, Part II. In the course of his speech, Mr. Hewitt referred to the advantage of gaining the confidence of the purchaser in the quality of the fruit and of the pack. When once the purchaser could be sure that the fruit was well picked—and a bad picker could easily spoil a basket which might be chosen as the sample basket for a large lot—and also that the fruit at the bottom of the basket was, as a matter of course, of exactly

the same quality as the fruit at the top, then business would go better and the fruit fetch more money. He thought that the canneries would do a great deal to assist the fruit farmer. *Mr. Bryant* and *Lord De La Warr* spoke on the motion, and the Report was adopted.

Sale of Fat Cattle.—*Sir Arthur Hazlerigg* presented the Standing Committee's Report (*see* Appendix II, p. 419) on the Sale of Fat Cattle by Dead Weight on the basis of the National Mark Grades. He said he had tried the scheme advocated in the Report, and found that, in some cases, it was better to sell the stock in the local markets, whilst in other cases it was better to sell under the National Mark Scheme. Farmers having well-fatted cattle for sale would do best to try the National Mark Scheme. The official grader made everything extremely easy, and it was always worth a seller's trying some other market to see if sales would not go better in them. The Report was adopted.

Grey Squirrel Damage.—*Sir Merrik Burrell* moved :—

> "That this Council is of opinion that the Grey Squirrel is a pest which in the interests of agriculture and horticulture should be drastically dealt with and that all possible steps should accordingly be taken to bring to the public notice the damage caused by it and the importance of its speedy extermination."

He said the Grey Squirrel had become a pest in many parts of England. There were something like three of them to the acre, and in Greenwich Park last year 800 were killed ; in Richmond Park, 400 ; at Ashridge Park, many thousands ; and in Windsor Great Park between 1,000 and 1,500. People got sentimental about them, but they did a very great deal of damage to eggs, nestlings, young plants, and cereals. *Mr. Bryant* seconded the resolution. He said that, in one of his own chicken runs, 16 chickens had been killed by a grey squirrel. These animals climbed into birds' nests, killed the young and threw them out. *Mr. J. Gibbons* (Gloucester) suggested that circulars might be sent round with the figures which Sir Merrik Burrell had given them, so as to expedite the action which the resolution suggested. *Mr. H. C. Gardner* (Worcester) said that in Herefordshire he believed that these squirrels had disappeared. *Sir Charles Howell Thomas* replied that it was quite a common thing for many classes of rodents to migrate from one part of the country to another. One saw it particularly with the small voles, which were very common perhaps one season and then disappeared from the district altogether for a long time. *Lord De La Warr* said that a

pamphlet on the destruction of grey squirrels was now in draft and in print. He hoped that, in the course of a few days, it could be sent to County Councils and to all organizations that were represented at the recent Conference on this subject over which Sir Charles Howell Thomas had presided. He was sure that the Minister was grateful to Sir Merrik Burrell for bringing this question forward. There was a good deal of misunderstanding about this really very dangerous pest to agriculture and horticulture. The motion was carried unanimously.

Royal Veterinary College.—*Colonel Sir G. L. Courthope, K.B.E., M.P.* (East Sussex), moved :—

> "That in view of the absolute necessity to the whole Empire of an adequate supply of efficient Veterinary Surgeons, and the consequent necessity of the re-establishment of the Royal Veterinary College, and having regard to the slow but steady progress of the collecting of the necessary funds for that purpose, this Council urges the Government to assure the Governors of the College of the necessary money required to cover any unavoidable deficit in carrying on the College for a further financial year, in order to give the Public further time to realize its financial responsibility towards Veterinary Science."

He said that everyone was aware of the imperative necessity to agriculture, not only in this country but throughout the Empire, of a well-trained, well-equipped, well-manned veterinary service. This depended on a properly equipped and financed Veterinary College. The state of the Royal Veterinary College was very serious. Its buildings had been condemned, and a scheme had now been prepared for their reconstruction and re-equipment. The necessary funds were still wanted. The Ministry had been able to obtain a considerable grant from the Development Fund on the condition that £100,000 was put up from private sources within a certain time, which was rapidly running out. Sir Merrik Burrell was Chairman of the Committee of Governors, and he had made great progress in obtaining about a half or more of the sum required. What he now asked was that a special grant should be made so as to allow the College to remain in existence for another year and thus give longer for the voluntary subscriptions to come in. This, however, must not be allowed to slow down or stop the flow of private generosity. *Mr. R. L. Walker* (West Riding) seconded the motion, and *Lord De La Warr*, in reply, said that it had already been decided to increase the block grant of £3,300 to just over £5,000 for the year. The Government had decided to do this, knowing the tremendous efforts which the Governors of the College were putting forward to collect

the capital required. *Sir Merrik Burrell* further explained the position of the College and the great need there was for the additional money at the earliest possible date. *Sir George Courthope* asked leave of the Council to amend his motion in order to make it one of thanks to the Ministry for something which they had done rather than urging them to meet a situation which had now passed. This was agreed to and the resolution was passed in the following terms :—

> "That in view of the absolute necessity to the whole Empire of an adequate supply of efficient Veterinary Surgeons, and the consequent necessity of the re-establishment of the Royal Veterinary College, and having regard to the slow but steady progress of the collecting of the necessary funds for the purpose, this Council thanks the Government for assuring the Governors of the College of the necessary money required to cover any unavoidable deficit in carrying on the College for a further financial year, in order to give the Public further time to realize its financial responsibility towards Veterinary Science."

Wheat Quota.—*Mr. H. C. Gardner* moved the following resolution :—

> "That as a means of increasing the area of land under the plough, of providing employment, and of adding to the National wealth, the Government be urged to bring into operation at the earliest possible moment a Quota system for milling wheat, with a guaranteed price for the Home crop to cover the cost of production."

He said that he thought it quite time that the Council came to grips with the more important matters in agriculture. Every civilized country had taken steps to increase its arable area, and this country should follow. Wheat was the best crop to grow because it was always saleable. One method to encourage its growth, and to keep the bogey of dear food off the election platform, was for the Government to bring in a quota system. It might be that not more than 15 per cent. of home-grown wheat would require to be milled, though the percentage might go up to 20. He hoped that the Government would soon be able to announce a policy in this connexion. With the quota there would have to be a guaranteed price, in order to give the British farmer encouragement, so that the wheat would be forthcoming. In the last few years, nearly 100,000 men had left the land and that exodus ought to be stopped. *Mr. A. E. Bryant* seconded the motion. The difficulty in farming to-day was so great that he himself thought of "clearing out" of arable farming and putting his land down to grass. *Mr. J. Beard*, in supporting the resolution, said that very few people outside agriculture realized the importance of wheat to the industry. They said,

quite sensibly from their point of view, that they could buy wheat from abroad very cheaply, so that there was no reason why they should spend more money in growing it in this country. If one were going to buy a pair of boots, the price would be fixed on those boots. The manufacturer knew his costs and the price at which he could afford to sell. When it came to wheat and agriculture, this principle was discarded, and farmers were expected to make a sacrifice for the good of the community. There had to be some end to that view, and he thought it might be brought about by the wheat quota. He urged the Council to consider the matter from the point of view of citizens and not from that of politicians. It was vital to the nation to see that the land was properly cultivated. *Sir George Edwards* said he would like to see added after the words "providing employment" the words "and a better standard of living for the agricultural workers." No one could look at the wholesale discharges of labourers in arable districts, and the number of acres going down to grass, without feeling alarmed, and concluding that something drastic should be done to assist arable farming. He thought that the wheat quota must be a step in the right direction. *Mr. Charles Roberts* (Cumb.) said he was sceptical about a wheat quota. The eastern counties in their desperate plight would turn to anything which seemed to provide a remedy. He was against subsidies from the Government because of the experience with the last under the Corn Production Act, when the Government ran away from their bargain "like a welsher on a race course." The question with him now was: Would a subsidy last? He was in favour of protection, but he could not convince himself that they could make out a case which was going to last permanently and be accepted by urban voters who would look at the matter from their own point of view. In the North, they had scrapped wheat long ago and were not sorry. Other farmers would want a quota on oats and others again on barley, and so it would spread. He thought that they would be wrong in basing their corner-stone on the shifting sands of a subsidy, which could be upset at any general election. *Mr. R. G. Patterson* (Staffs) in support of the resolution said he disagreed entirely with Mr. Roberts. He could only tell him in regard to the cry of dear food that if something of this sort were not done the people of the country would know what dear food really meant. The only protection from dear food was to protect themselves from combines from abroad who, if this country became defenceless,

would do what they liked with them. The greatest necessity of the country and for everybody to-day was a prosperous agriculture. Now, the horse was starving while the grass was growing. If they did not make haste, there would be no agriculture to benefit when the nation decided to do it. *Mr. R. C. Grey* (Hunts) said that the quota system would be putting the farmer on the dole, and two or three counties in England were going to get about three-quarters of the whole. *Lord De La Warr* said that he had had great pleasure in listening to the debate. All he could say on policy was that the Govern ment had recognized that something had to be done in arable areas. The subject was admittedly a difficult one and was being considered. He was sure that the policy of any Government could never really be a wheat policy, because we could not market wheat in competition with the world. But that did not mean to say that we were not faced with an appalling situation in parts of the country. It was the Government's endeavour to work out a scheme to carry over this difficult period, while continuing the definite policy of the production of commodities in which we could compete.

The motion was put to the meeting and carried.

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APPENDIX I

REPORT FROM THE STANDING COMMITTEE ON THE MARKETING OF HOME-PRODUCED HONEY

(1) In continuation of their series of Marketing Reports, made at the request of the Council, the Standing Committee now present the following Report on the Marketing of Home-Produced Honey. The Committee have independently interviewed several witnesses whose business is that of honey production and sale, to whom they tender their best thanks for the evidence they have been so kind as to give. A curious fact in connexion with it is the diversity of experience and views of most producer experts. This is, probably, largely owing to the diversity of conditions, bee-stocks, and bee-keeping aims and methods in various parts of the country, but it has made the Committee correspondingly cautious in discussing any questions dealing with honey production. The Committee have, in consequence, confined themselves to an analysis of their main subject, viz., that of honey marketing, and their recommendations are based on general lines which they trust will commend them to all sections of the industry alike. There is no doubt that the industry is a really important one, not only from the point of honey production but also as a necessary adjunct to a successful fruit-growing industry.

(2) In the first place, it is not disputed that home-produced honey is a valuable product, whose qualities as a food are insufficiently recognised by the people of this country. It varies widely in colour, taste, and general appearance, but it is always an easily-digested substance of high food value. There are Clover honeys, Sainfoin honeys, Heather honeys, and others from Lime tree blossoms, fruit blossoms, and from Charlock. Occasionally, some of these are found mixed together in the

combs, though bees of one hive appear to draw their honeys from one and the same source where it is of sufficient abundance in the district. Some bee-keepers, by seasonal transportation of their hives, or otherwise, are able to arrange for two and even three separate honey harvests in every normal year. Imported honeys are often from other kinds of flowers, *e.g.*, Orange Blossom (California), Eucalyptus or Blue Gum (Australia), and Tea Tree (New Zealand), and they are generally inferior in quality to home production. New Zealand honey obtains the highest price among imported honeys on our market, and a good deal of that is Clover honey, as, no doubt, is some of that also from Canada. Notwithstanding the fact that imported honey is usually inferior to the best home-produced, the importation is comparatively large. At the same time, the demand for home honey, taken over a period of years, is always ahead of the supply. These facts point to the conclusion, to which the Committee have arrived, that there is much scope for improvement both in the production and in the marketing of home honey. Both will be assisted by proper advertisement of the product and the consequent realization by the public of the outstanding value of the home crop.

(3) The average annual production of honey in England and Wales is estimated at round about 30,000 cwt. The average annual consumption of the United Kingdom is about 100,000 cwt., so that, allowing a few thousand cwt. for production in Scotland and Northern Ireland, the home supply for the United Kingdom in a normal year is, at present, about one-third of the total consumption. The figures are necessarily rough and ready, since the home supply varies a good deal from year to year, and no statistics of yield are annually compiled. The only definite annual figure is that of the importation into the United Kingdom, which averages, in recent years, about 68,000 cwt., after taking re-exports (about 10 per cent.) into account. Of the total importation, 47 per cent. comes from British countries (mainly New Zealand, West Indies, Canada and Australia) and 53 per cent. from foreign countries (mainly U.S.A.—about one-half—and the remainder chiefly from Chili, Russia, Cuba and San Domingo). The consumption of honey in the United Kingdom is therefore only ¼ lb. per head per annum, and the consumption of home-produced honey is no more than 1 oz. per head per annum—a very small figure indeed compared with other countries where honey is more appreciated at its proper value.

(4) So much for the general situation. Balancing home production with imports it appears that without any increase at all in home consumption the present production of the United Kingdom could be doubled and not affect the quantity of Dominion and Colonial supplies, that is to say, the additional home supply would just about displace the foreign importations. That, however, is a statement having a statistical rather than a practical value, because there can be little doubt that as soon as the supply of home honey is organized and the commodity put upon the market in a standardized quality-guaranteed form, and honey, as a food, suitably advertised, the total consumption in the country will go ahead by leaps and bounds.

(5) As regards our present honey-marketing system or lack of system, it must be said quite definitely that, in general, the home product is not well presented on the market. The same story holds good for honey as for wheat and certain other commodities which can be stored without great deterioration. Under present conditions, large bulks of it are rushed upon the market immediately after harvest, mainly in order to realize ready money irrespective of the total loss through lower prices. The remedy, in practically all cases, is orderly marketing by the executives of groups of producers acting on a preconcerted plan. With regard to honey, nearly all that of the small producers, which constitutes the

larger part of the crop, is presented on the market in the late summer and early autumn of the year, and, were it not for a usually ready sale locally, might find difficulty in competing with the graded, imported supplies. Already these are well entrenched in the large industrial markets and there seems no reason why they should not soon become quite as common and popular in country districts—at any rate, during that part of the year when home honey is not readily obtainable. As the Committee see it, the future of home honey production is bound up with proper organization for sale, and it is necessary in the interests of production and producers that this operation should be taken in hand speedily.

(6) In the course of arriving at this conclusion, the Committee were brought, by those who take a despondent view of the future of English honey production, face to face with such widely held facts and views as the following: that good honey years are none too numerous, being only about one in four; that commercial honey production is a very risky business and almost certain to be met with loss; that small producers are too scattered to combine, and many do not think of bee-keeping as anything more than a side-line which, if it proves successful in one year now and again, pays for itself with little trouble; that such bee-keepers are unlikely to trouble about joining organizations for better marketing; or, indeed, are unlikely to trust any authority with their honey to grade it and even, in certain circumstances, to mix or blend it and to sell it: and that they would always prefer to sell it themselves to the local grocer more or less as it comes from the hive.

(7) But the Committee did not see their way to take that view. They were ready rather to be guided by the example of those who had made a commercial success of honey production and had increased the number of their hives in spite of bad years; who made a practice of annually requeening their stocks; who saw to it that they kept only stocks of the bees which produce high yields of honey, and who used means of storage of honey after proper treatment so as to hold over supplies from bountiful years and small prices to poor years and better prices. Moreover, the Committee could not think that any industry which was worth following at all was not worth making the most of by those engaged in it, and if some of the present generation were not disposed to do that, others would follow who would use all the reasonable means adopted by the successful ones to make themselves successful. A further point is that the article they are producing is one of outstanding quality amongst the honeys of the world, and any *non-possumus* attitude with regard to the development of the industry, side by side with the development which is going on all over the world in honey production, must obviously be wrong. If the industry is allowed to stand still, it will, in effect, go back. Competitors will gain upon it and their goods will in time monopolize the home market.

(8) At the same time, it is true that there are districts of the country in which bees are now kept which, in a poor honey year, are not suitable for the maintenance of more than a few hives; where the soil, climate, and flora are not suited to commercial honey production on any but a small scale. A good season, however, may turn a poor district into a fair one, for then honey can be produced almost anywhere. But for commercial purposes, and taking the ordinary run of years, it seems necessary to work only in good or moderately good honey districts, and definitely to restrict the number of bee stocks per square mile kept in a poor district, *i.e.*, if honey production in them is to be a paying proposition. There appears indeed to be a maximum normal capacity of each district for a healthy and thriving population of bees, and honey production

suffers considerably in it if it becomes overstocked. That, however, is a production point, and, on it, the Committee are content to observe that, as a first step in any general scheme for improving honey production, it would seem to be desirable that the country should be mapped out into good, medium, and poor districts, with an indication of their present and potential bee population in numbers of hives, so that it might be seen plainly by all which districts afford the greatest opportunity for expansion and in which, if any, the maximum normal production has already been reached.

(9) We wish to take the opportunity here of referring to the value of the work which is being done, in the few counties which have appointed them, by the county bee-keeping instructors, and also in others by the county bee-keeping associations. In many villages, schoolmasters have placed bee-keeping in the curriculum of instruction given to the older students. In some of these instances, the wood-working classes in the same schools make the hives and other wooden appliances, and the metal-working classes any simple metal appliances, whilst such things as veils are supplied by the girls' needlework classes. We were informed that bee-keeping as a nature study for boys and girls is a very popular one wherever it has been started, and a large proportion of those children who remain in the country when they grow up usually continue to keep bees. We were informed that the question of bee stings to the school-children is a trivial one and easily met by the use of a little ammonia. We were gratified to learn about the pioneer work which many school-teachers are doing in this matter up and down the country, thus helping to bring school-teaching more and more into line with the child's country experience and environment and making the education given more effective. We were so much impressed with the usefulness of this kind of work that we propose later to consider and discuss in a Report, to be presented to the Council, certain bearings of the question of rural education and rural environment.

(10) We should mention, also, the excellent work which is being done by Young Farmers' Clubs in carrying on the work started in elementary schools, or in introducing bee-keeping as a fresh subject to their members. We consider that Young Farmers' Clubs might be still more helpful in developing a larger bee-keeping industry in the country, and we should be glad to see the number of bee-keeping clubs within them extended as far as possible, and we recommend this object to the special notice of the National Council of Social Service, which is responsible for the running of the Young Farmers' Clubs.

(11) Turning again to the actual question of marketing honey, there are two distinct sides in an organized honey industry, viz., (i) that dealing with "sections," and (ii) that dealing with "extracted" honey.

(i) The "section" side is simpler from the point of view of equipment because the honey is sold practically as it comes out of the hive. Proper cleaning of the frames and packing of sections is, however, necessary, and great care should be taken. Where storage is necessary whilst sections are awaiting marketing, it is of the highest importance to keep them in a thoroughly dry chamber.

(ii) Extracted honey; in this case more preparation for marketing is needed. In the first place, straining—after the honey has passed through the extractor—in order to clear out all pieces of comb and any other foreign matter. For this purpose, if the operation is to be properly performed, it is generally necessary to use heat—usually up to about 90° F.—in order to make the honey run more easily through the muslin straining cloths. Honey only partially strained and cleared

of foreign matter cannot be regarded as first-class, whatever its colour or flavour. This point shows the need there is for the honey of small producers to be brought together and dealt with, *en masse*, at a local depot where all the proper machinery is available. Besides the extractor and the heating and straining, there are the tanks for "settling" in order to allow the tiny air bubbles which make the honey look cloudy to rise to the surface. This is best done by vacuum settling tanks, which relieve the air pressure on the surface and enable the bubbles quickly to rise and vanish. Another purpose of proper heating of honey is to prevent crystallization, or, at any rate, to hold it in check for many months if necessary before the sale of the honey. From the tanks, the honey is drawn off through taps at the bottom and bottled or otherwise put up for sale. In the most up-to-date tanks copper pipes are run round the lower part inside for the circulation of hot water. This enables a quicker flow of honey from the taps. All depots dealing with extracted honey should be equipped also for blending—a necessary operation when the market requires honey of a definite colour and flavour which may not be produced from the local hives in any uniformity year by year. For the purpose of blending and mixing, heating again is required, and, since honey tends to lose its bright colour and some of its flavour through heating, and to change a little in its composition if it is held at a high temperature for some time, the operation has to be performed carefully and as quickly as possible.

(12) Then as regards containers and labels; it is practically essential if the honey is to be widely sold that the containers used should be of a sensible and suitable type. Tall bottles or jars are sometimes used which besides being clumsy-looking make it awkward to get at the honey at the bottom; and earthenware jars or crocks do not admit of the purchasers seeing the honey they are buying. The Ministry of Agriculture is suggesting new standard glass jars of 1 lb., ½ lb. and ¼ lb. These standard containers, as well as cardboard cartons with transparent film windows back and front, and also large, folding cardboard-cartons as standard packages for honey in sections and jars, should be useful for general adoption as soon as the National Mark for honey can be brought into force. There are no doubt other standard packs which it will be necessary to work out, but the choice and adoption of these can be safely left to the industry as soon as it has become more effectively organized.

(13) Enough has been said in regard to the proper treatment of extracted honey to show that it is a business which if done at all should be done well; and it will be realized that if a large market is to be got for it, it must be turned out all over the country in uniform fashion. Standardization of quality must be the first aim if the larger urban market which awaits it is fairly to be attacked. In the Committee's view, this must mean the use of central depots for grading, blending and bottling honey in the manner in which it will sell best.

(14) At this point it will be realized how useful the National Mark methods will be for certifying quality of honey. The different classes of it can be graded to uniform standards throughout the country on a common description known to all depots and adhered to by them in making up their packs. As is well known, it is a condition of the use of the National Mark that where standards are not adhered to, the privilege of using the Mark is forfeited. This condition, in practice, gives the public that guarantee of certainty that they are buying what the label states is being sold, and places the article in a class by itself among competing produce. A new article brought under the National Mark immediately acquires pre-eminence. It has behind

it the mass advertisement that has already taken place for the various National Mark commodities on the home market in the last few years which cannot fail to be most helpful to it. It appears to the Committee that there can be no better way of dealing with honey than to bring it under the National Mark. It can be done by means of common treatment of extracted honey at depots and by affixing the National Mark to sections produced by members of bee-keeping associations when these reach the standards which shall be laid down.

(15) The Committee do not propose to go more deeply into the subject. That has been done in the very excellent Report recently issued by the Ministry of Agriculture on "The Marketing of Honey and Beeswax in England and Wales, 1931," Economic Series No. 28. This Report gives a complete survey of the position as regards honey production and marketing. The points are briefly and succinctly put and the Committee think that every bee-keeper should study the Report with a view to making it the basis of a new and up-to-date organization for the preparation and sale of honey to our urban populations.

(16) The advice, then, which the Committee would suggest to the Council should be tendered to bee-keepers is that, in their view, after careful inquiry of all the available facts, there is a first-class market awaiting their product in the towns of this country. It should be their business, despite the variations in quality and quantity of production from year to year, to supply the urban market with uniform packs of honey of the quality, or qualities, it requires.

May 28, 1931.

APPENDIX II

REPORT FROM THE STANDING COMMITTEE ON THE SALE OF FAT CATTLE BY DEAD WEIGHT ON THE BASIS OF THE NATIONAL MARK GRADES

In the course of its inquiries into marketing methods under the National Mark and otherwise, the Committee was informed of the scheme instituted by the Ministry of Agriculture for the direct sale by farmers to meat wholesalers, in those markets in which the National Mark for beef is operative, of fat cattle by dead weight on the basis of the National Mark grades. The essence of the scheme is that the Official Grader at the market obtains for a farmer quotations from one or more meat wholesalers for fat cattle of National Mark quality for the current week. The farmer receives these quotations and, if he accepts one of them, sends his live cattle to the market for slaughter and sale on the guarantee of the price which it gives. That price is one per dead weight stone (sinking the offal) and varies according as the meat is subsequently graded as "Select," "Prime" or "Good" by the Official Grader. The National Mark for beef is at present only operative in the London meat market, at Birmingham, and at Leeds, Bradford and Halifax. This scheme, however, has so far not been used for any consignments other than some coming to the Islington abattoir for the London (Smithfield) Market. There seems to be no reason why it should not be used at the other markets in due course. The Ministry has issued a Marketing Leaflet, No. 27, which fully explains the system.

The points which interested the Committee especially about the scheme were the following. Under it, auctioneers' fees and other expenses are saved, and the farmer knows beforehand what price he is going to receive according as his stock are graded "Select," "Prime" or "Good"; his cattle usually reach the abattoir in better condition than when they are sold through an auction mart because they avoid deterioration through unnecessary journeys, waits in the market,

repitching, etc. Furthermore, the farmer is paid on the full dead weight of his cattle. When he sells live weight over the weighbridge, he sells by the stone of 14 lb., on the assumption that the dead weight will be the same in stones of 8 lb. When, therefore, a beast weighs out above this recognized proportion of dead weight to live weight, the farmer is paid less if he sells by live than by dead weight. The reverse may be the case where poorly finished beasts are marketed, though the butcher or buyer would be likely to give a smaller live weight price for such cattle. An instance of the working of the scheme is as follows. Take a group of animals weighing 470 stone live weight, the farmer selling for slaughter by live weight would be paid for 470 stone of meat dead weight at 8 lb. to the stone. If—as actually happened with a group of cattle of this weight from Sussex—the animals weighed out dead weight 501 stone, the farmer would be paid the full dead weight price for every dead weight stone. Even where farmers receive some allowance for a probably larger dead weight percentage in the case of exceptional animals when selling on the live weight basis, that allowance is not likely to be adequate, or, at any rate, the farmer will have no assurance that it is so.

Under the scheme, a farmer pays the carriage to London and 1*s.* per head insurance. Those costs are not regarded as disproportionate to the value of the service, and one farmer sending from a distant county has stated that his average gain through using the scheme is about £1 per head. Other farmers who have used this scheme have expressed themselves as well satisfied with the results. The Committee therefore recommends it to others for trial. No doubt the scheme would on request be worked for other of the National Mark beef markets than Islington.

On present beef prices, it is suggested that the scheme is likely to be more useful in the case of the sale of medium and heavy weight fat cattle than in the case of young early-fattened cattle of the same class as the best Scotch. These young cattle are often sold in local markets at better prices than are obtainable in London where the competition with young Scottish National Mark beef would be keen and where in fact the trade for the best young beef is already fairly fully supplied.

May 28, 1931.

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NOTES ON PRICES AND SUPPLIES

R. J. THOMPSON, C.B., O.B.E.,
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THE limited quantities of English wheat on offer during the last month resulted in improved prices, but rates in the world wheat market, though fluctuating, tended downwards. Fat cattle showed a seasonal improvement, but fat sheep declined. Pigs were decidedly cheaper, porkers falling in sympathy with the drop in pork consequent on the reduced summer demand, while the sharp break in bacon prices influenced bacon pigs. Practically all agricultural commodities, except potatoes, continued at lower levels than in June last year, the average decline in the principal products sold by farmers, as indicated by the Ministry of Agriculture's Index No. for May, being 9 per cent. as compared with a year earlier, and 15·3 per cent. as compared with the same month in 1929.

Some comparative prices ruling a month ago and a year ago are shown in the table* below.

	Prices in the second week of		
	June 1931	*May* 1931	*June* 1930
	s. d.	s. d.	s. d.
Wheat, Gazette average, per cwt. ..	5 11	5 8	8 7
Fat cattle, 1st quality, per cwt. ..	51 0	48 11	54 1
Beef, English, N.M. prime, per lb. ..	8	7¾	8¾
,, Argentine, chilled H.Q., per lb. ..	6¾	6⅝	7¼
Fat sheep, 1st quality, per lb. L.W. ..	1 0	1 0¾	1 1¾
Mutton, English, per lb.	1 0	11¾	1 1¼
Lamb, New Zealand ,, ...	8¼	7¼	9½
Bacon pigs, 1st quality, per score ..	11 10	13 4	15 7
Bacon, Danish green, per cwt.	63 0	84 0	105 0
Pork pigs, per score	13 4	15 5	17 1
Pork, English, per lb.	8	9½	10½
Eggs, N.M. Standard, per 120	10 0	10 6	12 6
Potatoes, King Edward (Lincs. & Yorks.) per ton	210 0	190 0	80 0
Wool, Southdown, per lb. (at Bradford)	11	1 0	1 3½
Maize, Argentine, per cwt.	4 2	5 2	6 8

Wheat.—An important problem in the wheat situation at the present time is the future supply of Russian wheat. The total export from the Soviet Union in the twelve months up to August next will probably amount to some 14 or 15 million quarters from a crop estimated at about 129 million quarters. This crop was obtained from an area of about 86 million acres.

* The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending June 10, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

For 1931 an increase has been planned, which would bring the total area up to nearly 104 million acres, made up of 31 million acres under winter wheat and 73 million acres under spring wheat. The winter wheat area has apparently been realized, but a late start was made with the spring sowings owing to the backwardness of the season, and up to June 5 the area planted was only 60 million acres, leaving a balance of 13 million acres still to be sown. The sowing season, however, continues well into June, and at the recent rate of progress the completion of the area planned is by no means improbable. Even if it is not fully attained, a total of 95 to 100 million acres of winter and spring wheat is likely as compared with 86 million acres last year. In that case, given fair growing conditions, the Soviet Union should be in a position to export larger quantities of wheat in 1931-32 than it has done in 1930-31. This, of course, depends on the out-turn of the harvest, but even if the average yield per acre should be less than last year, the counter-balancing effect of the larger area is an important factor. On the information at present available an export of wheat from Russia fully equal to that of last year must be regarded as extremely probable, while a favourable harvest would certainly result in appreciably larger quantities being shipped.

The extent of the Russian wheat area, which, it must be remembered, is planned to show a further increase of 10 or 12 million acres next year, has obviously a very important bearing on the future wheat supply of the world. Before the War, Russia was one of the principal sources of supply and exported an average of about 19 million quarters annually in the 5 years 1909-13, from a total area of 74 million acres. During and after the War, other countries increased their acreage to make good the absence of Russian supply. They have succeeded so well that they can alone, with normal harvests, fully supply the requirements of importing countries, while as the result of some good harvests a large surplus has been accumulated which cannot be disposed of even at the very low prices now prevailing. If, as appears practically certain, Russia is re-entering the export market on a permanent basis with an acreage increased from 74 million acres to, say, 95 million acres this year and possibly 110 million acres next year, it is difficult to see what alternative there is to a reduction in acreage and production elsewhere.

An increasing consumption would, of course, help to solve the dilemma, but this is not easy to attain under present conditions, as most of the importing countries, in order to

assist their own agriculturists, seek to maintain prices at a high level and thus discourage buying abroad. A further movement in this direction is reported from Italy, which, following the example of many other European countries, is proposing to adopt the quota system. It is sometimes suggested that there is a large opening for increased consumption in China and the East, but this is only possible if a material change takes place in the standard of living and feeding habits of the people, and would, in any case, be a slow process. The actual quantity imported into Asiatic countries varies from year to year with the harvest of wheat, rice and other grain, but the largest quantity taken in recent years was in 1929, when it amounted to the equivalent to 16 million quarters of wheat. A great development would consequently be needed before these countries increased their consumption so as to affect materially the supplies available. The only solution which appears feasible is a reduction in acreage in exporting countries, and this will on doubt be forced on cultivators by unremunerative prices. In the United States a reduced area is strongly urged by the Federal Farm Board and by the Department of Agriculture, and although not much notice has been taken of the advice this year, the figures for 1931 will probably show a substantial reduction. Smaller acreages in Argentina and Australia also appear likely.

Turning to the position of the growing crops, spring wheat in Canada has been injured by drought, and the condition on June 1 was given as 80 per cent. as compared with 96 per cent. at the same date last year. Even if conditions should improve, not more than a moderate crop is expected. In the United States the winter crop is estimated to yield 649 million bushels, which is the highest figure for many years, though the condition of the crop at the beginning of June was rather less favourable than in May. Spring wheat as in Canada has suffered from unfavourable weather, and the condition was returned as 67·9 per cent. as against 85·7 per cent. last year. Among European crops Germany showed an under-average condition on June 1 and appreciable loss from frost was reported.

The total shipments of wheat have been well maintained, and up to June 13 the total calculated by the *Corn Trade News* amounted to 86,803,000 qr. compared with 66,279,000 qr. in the corresponding period of 1929-30. This increase has not been sufficient to reduce appreciably the existing surpluses, and the total carry-over on July 31 is likely to be much the same as in the preceding year. Demand in the middle of

June was very slow, buying being on a hand-to-mouth basis in view of the near approach of the European harvest and the possibility of lower prices. The Liverpool July wheat future, which on May 14 stood at 4*s.* 7½*d.* per 100 lb., did not again touch that figure during the ensuing four weeks and on June 15 closed at 4*s.* 3⅛*d.*

Cattle and Beef.—A good proportion of well-finished beasts have been on offer in recent weeks and values have improved, prices for the week ended June 10 averaging 51*s.* per live cwt., first quality, as against 48*s.* 11*d.* a month earlier and 54*s.* 1*d.* in June, 1930. In addition to cattle from Ireland, stock are now being received regularly from Canada, the number landed in May being 1,788. Unlike shipments in past years, practically all these were fat cattle fit for immediate slaughter, only 51 being licensed out for further feeding. Beef prices show little alteration, National Mark prime varying from 7¾*d.* to 8*d.* per lb. and Argentine chilled H.Q. from 6½*d.* to 7*d.*

Imports of chilled beef continue on a moderate scale, the combined receipts from Argentine, Uruguay and Brazil in the first five months of this year being very similar to those in the same period of 1930. An increase in cattle raising (and dairying) in Argentine seems not unlikely to result from the low prices now ruling for wheat and maize, which will tend to force farmers in some areas to seek more profitable outlets. The number of cattle in Argentine has declined from 37 millions in 1922 to 32 millions in 1930, and a renewed expansion seems about due, though, apart from the United Kingdom, Argentina has difficulty in finding an outlet for the export of chilled meat. The total shipments to the Continent this year are greatly below those of last year, owing to the high tariffs and restrictions imposed by several European countries, while the United States market, which at one time seemed likely to draw on Argentina, is practically closed.

A well-marked seasonal decline in the price of milking cows usually occurs from January to June, owing to the decrease in demand as more cows come into milk and the milk yield is increased by the flush of grass. Thereafter, conditions are reversed, and demand for cows improves until about November, being accentuated by the requirements of milk producers who want to strengthen their milk supply in October and November. This year has so far been no exception to rule, prices having declined steadily from £27 16*s.* 0*d.* per head in January to £25 4*s.* 0*d.* in May. Store cattle, on the other hand, showed a

seasonal rise in May, the average for 2-year olds and yearlings being £15 8*s*. 0*d*., which compares with £15 15*s*. 0*d*. in May, 1930, and £15 3*s*. 0*d*. in 1929.

Sheep, Lambs and Wool.—The number of sheep and lambs on offer recently has been about average, but prices, after showing a short rise, gradually declined, and from the end of May to the middle of June only averaged the low figure of 1*s*. per lb., first quality, dead weight. The imports of New Zealand lamb, the chief competitor with English mutton, now shows some signs of diminishing, though the quantities afloat are still very appreciable, and the stocks in store or loaded in New Zealand at the end of May were 2,007,000 carcasses as against 1,912,000 at the same date last year. The killing season is, however, nearly over, and some improvement in price has taken place, best Canterbury lamb being quoted by the Imported Meat Trade Association in the week ended June 12 at 7⅞*d*. per lb., after being as low as 6⅝*d*. some weeks ago.

The price of store sheep is usually high in May, but during the past month the average has only been 54*s*. 8*d*. per head, against 62*s*. 5*d*. in the same month of last year. Normally, prices in the autumn are lower than in the preceding May, and last year they fell from the May figure of 62*s*. 5*d*. to an average of 50*s*. in the three months August to October. Supplies this year seem likely to be ample, and a decline in the prices of store sheep must be expected.

The improvement in wool prices that took place in March and April was not maintained, and prospects early in June were unfavourable. The consumption of cross-bred wool, which is the grade that chiefly influences British wool, is very poor, and the market is over-supplied in relation to the demand.

Pigs, Pork and Bacon.—Fat pig prices fell steadily during May, and in the week ended June 10 the average price for porkers was 13*s*. 4*d*. per score dead weight, and for baconers 11*s*. 10*d*. as compared with an average of 16*s*. 1d. and 13*s*. 7*d*. in April. The supply of fat pigs at markets in recent weeks has been rather liberal, and this may have contributed to lower prices, but the fall is largely seasonal, coinciding with the drop in the demand for pork, the price of which fell to 8*d*. in the second week of June as against 9½*d*. a month earlier and 11*d*. in April. The decline in pork has also probably been influenced by the renewed slump in bacon prices. Imported sorts were chiefly affected, Danish, for example, falling from 84*s*. per cwt. in May to 63*s*. per cwt. in June. The decline in home-produced

bacon was more moderate, but best English Wiltshire and first quality Irish were each 10*s.* per cwt. lower on the month.

Imports of bacon in May were exceptionally high, amounting to 965,000 cwt., and bringing the total for the first five months of this year up to 4,428,000 cwt., an increase of 920,000 cwt. or 26 per cent. over the total of 3,508,000 cwt. received in the same period last year. Of this total, 2,946,000 cwt., or 740,000 cwt. more than last year, came from Denmark, while the remainder of the increase came mainly from Poland and Lithuania, both of which are making considerable efforts to share in the British market. Poland now occupies a position in the bacon trade comparable with that of Holland and Sweden, and has already exported this year (January-May) over 400,000 cwt., whereas the receipts from this source were only 305,000 cwt. in the whole of 1929. Owing to tariff provisions in Germany and Czecho-Slovakia, both Poland and Lithuania find increasing difficulty in disposing of live pigs, and this tends to make it more necessary for them to export bacon to Great Britain. There seems no sign of any immediate decrease in supply, though killings in Denmark in the last two weeks have been somewhat lighter.

Store pigs in May were again somewhat cheaper in sympathy with the decline in fat-pig prices, the average for all grades being 36*s.* 9*d.* as against 38*s.* 9*d.* in April. At these prices store pigs are considerably cheaper than in the last two years, though not so low as in 1928, when an average of 30*s.* 5*d.* was reported. Feeding stuffs were also rather cheaper and a typical feeding mixture, composed of barley meal, maize meal, middlings and oats, which would have cost £6 10*s.* 0*d.* per ton early in May, could have been bought in June for £6 3*s.* 9*d.*

Butter.—Imports of butter during May continued on a high level, the receipts from Australia and New Zealand being large for the time of year. Total imports into the U.K. during May amounted to 723,000 cwt. as compared with 671,000 cwt. in April and 609,000 cwt. in May, 1930. Production in Australia and New Zealand is declining, though still considerably larger than last year.

The apparent consumption (*i.e.*, the quantity passing into distributors' and retailers' hands) has decreased, and for the four weeks ending May 30 was 487,000 cwt. as against 648,000 cwt. in the preceding similar period, with the result that the quantity in store has risen to 558,000 cwt., which, however, is only about half the stock at the same date last year. Prices,

though fluctuating, are rather above the low figures recorded in May, and on June 12 the top price recorded by the London Provision Exchange was 112*s.* per cwt. for finest New Zealand, 108*s.* for Australian and 120*s.* for Danish.

At these prices the return obtained for milk by the New Zealand and Australian producer cannot be very satisfactory, but production this season in the Southern hemisphere has been large, and, apart from home consumption, export to Great Britain is almost the only outlet. A year or so ago, about 20 per cent. of the butter exported from New Zealand went to Canada, but this export has now ceased and New Zealand is dependent on British purchases. In Europe also the tendency is for supplies to be increasingly directed to the British market; Germany, which is normally a larger buyer, imposed a higher tariff in November last, and the result is seen in the reduction of imports into Germany in the first four months of this year to 584,000 cwt. as compared with 741,000 cwt. in the same period last year.

Cheese.—Imports of cheese from New Zealand in the first seven months of the present season (November-May) amounted to 1,410,000 cwt. as against 1,244,000 cwt. in the same period in 1929-30. Indications of future imports suggest that arrivals in July and August will be smaller than the corresponding period last year, and the more moderate supplies in prospect are, perhaps, showing in the better prices ruling since the beginning of May. At that date the top price for New Zealand coloured cheese was only 51*s.* per cwt., whereas in the middle of June 58*s.* per cwt. was reported, a price which compares with 84*s.* last year. The Canadian cheese season has just begun, and present indications are that imports will be on a moderate scale, possibly a little lighter than last year. The price of manufacturing milk for June under the current milk scheme is again 4½*d.* a gallon, or just half what it was in the corresponding month two years ago.

Feeding Stuffs.—The existing large supplies of wheat and maize are the factors that are influencing the general price level of all feeding stuffs, and until these supplies begin to be reduced there is not likely to be any material change, though prices will naturally be affected by the coming harvests, in regard to which definite information is not yet available.

With free arrivals of maize from Argentina, prices fell sharply at the end of May, and La Plata maize *ex* store was

quoted in the middle of June at 18*s.* per qr. in London. The output of the Argentine maize crop this year at over 43,000,000 quarters exceeds all previous records, but the estimated surplus available for export is not put at more than 35,000,000 quarters, which is about the quantity exported in 1927. The low prices now ruling are stated to be below the cost of production in Argentina, and the Argentine Government is urging cultivators not to be in a hurry to sell. "It is considered," says the official announcement, "that maize prices ought to be higher than they are to-day, a view which is warranted by the fact that in the world markets the Argentine Republic is the sole vendor, and that even when the Argentine surplus has been completely exported it will be insufficient to meet the requirements of the purchasing markets." In order to assist growers to hold their maize, the Government has arranged for the banks to make liberal advances on maize at the ports and in stack. Railways rates have also been reduced. Shipments are, however, being made on a liberal scale, about $7\frac{1}{2}$ million qr. being reported from April 1 to the middle of June as against $2\frac{1}{2}$ million qr. in the same period last year. In South Africa, harvest conditions have not been favourable, and the latest estimate gives the yield as 6,650,000 qr., compared with 9,600,000 qr. last year. The supply of South African maize in this country is therefore likely to be short.

British feeding barley has been quoted in recent weeks at 5*s.* 9*d.* per cwt., with imported sorts rather cheaper. The position in exporting countries does not suggest any immediate change in the price level; both in Canada and the United States values are much lower than they were a year ago, though the condition of the growing crops in both countries is not too promising. Sales for future shipment from Russia and elsewhere have been made at prices comparable with those ruling earlier in the year.

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JULY ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

Fallows.—The fallow period in the management of arable land is as old as agriculture itself. The aim is to rid the land of weeds and other pests and at the same time improve its physical condition and allow a certain amount of recuperation of plant food, a factor which is stimulated by extra cultivation ; in dry arid countries the main object and benefit of the bare fallow is to obtain an accumulation of moisture.

Improvements in crop rotations and manuring have modified the need for leaving the land in bare fallow, but there are large areas of good wheat-growing land where a fallow crop is expensive to cultivate and the returns are not sufficiently remunerative ; moreover, improvement in the physical condition of very heavy soils is more easily obtained under bare fallow conditions, as the necessity for creating a tilth does not arise until the autumn seeding season.

The cultivations for a cropped fallow are dictated mainly by the requirements of the crop being grown, and usually involve much manual labour in collecting weeds (such as couch) that cannot always be effectively killed in time for the sowing of a root or fallow crop. Most fallow crops require a good deal of hand labour.

Bare fallows can be handled with horse or tractor ploughing and cultivations, and provided the weather is suitable and the soil kept in big clods or blocks such as are obtained by a late first ploughing and a subsequent cross ploughing, the sun and wind should bring about the killing of weeds and improvement in physical condition.

If weather conditions fail in May and June then a bare fallow must be tackled by breaking up the soil and destroying the weeds by frequent cultivations, otherwise the last state may be worse than the first. The sowing of a green crop such as mustard then becomes more necessary, in order to minimize the necessity for repeated cultivations after the work of weed destruction has been completed. Such a cover crop keeps weeds under control and provides a good bulk of green manure, which materially benefits the succeeding crop.

On heavy soils, when weather conditions have been favourable and the necessity of working down to a tilth does not arise until late autumn, the green manure crop can be dispensed with, and a dressing of farmyard manure applied on the fallow is good practice and an excellent preparation for wheat.

On soils of a light character a complete bare fallow is seldom advisable. Such soils often suffer from a shortage of organic matter and the bare fallowing process tends to deplete the supply further. Light soils should be handled quite differently from heavy soils; cleaning operations should be pushed on early in the season and if no root crop is to be grown a green manure crop such as mustard should be sown. This crop may be fed off by sheep or wholly ploughed in. An alternative to mustard is the use of leguminous crops such as lupins or vetches. These crops are slower in growth than mustard and it is too late to sow them this year. Lupins thrive well on light soils even when lime is comparatively short, and they provide excellent green manure. Vetches are easily grown, provide a big bulk of produce, and in theory ought to be very beneficial; in practice this is not always the case, and for some unaccountable reason very indifferent results sometimes follow. On light land a cruciferous crop like rape or mustard is often much more beneficial and should be preferred.

The type of fallow on which work is most important during this month is what is termed the bastard fallow. Such a fallow is common in the southern counties and may follow an autumn-sown crop of trifolium or vetches, or a one-year ley of trefoil and white clover, either of which may have been made into hay or fed off. Such a fallow is also used to a considerable extent where temporary leys of two or three years' duration are used. On such leys it is common to take a crop of hay and immediately afterwards the land is broken up and cleaned in preparation for an autumn-sown cereal. The use of tractors has greatly facilitated this desirable type of fallowing. The land most suitable is of a light character, but even so the dryness of the ground after a hay crop often makes the initial breaking up difficult or even impossible for horses. The system provides work for the tractor at a period when no other tractor work is urgent. The land should not be kept too long in a bare condition. It is not uncommon for farmers to complain that they folded off a good crop, gave the land a good doing as a bastard fallow and grew a rather indifferent crop of wheat. The disappointment may be due to a deficiency of organic matter after a very dry and hot fallowing period, but it may also be due to a bad attack of the Wheat Bulb Fly. This fly lays its eggs freely on bare ground in the late summer and these hatch out and cause much damage to wheat in the following year. In either case the use of a cover crop of rape or mustard would be beneficial, and, provided the necessary

cultivations for cleaning the land can be carried out in time to allow 10 weeks' growth for rape or 8 weeks for mustard, it is possible to obtain a useful sheep feed or green manure that will benefit the succeeding crop.

On farms where a more or less complete system of mechanization is adopted the bastard fallow would appear to be the most economic and practical method of cleaning the land and restoring organic matter.

Harvesting.—Cutting of grain crops commences this month in the south with rye, to be followed by winter barley, winter oats and wheat. Spring-sown crops are not usually ready until August.

Are we on the eve of a big change in harvesting methods? Many farmers are frankly sceptical about combine-harvester-threshers being of any general use under the ordinary conditions of grain growing in England. More and more farmers, however, are interesting themselves and making inquiries about them. The success of the combine in the great wheat-growing areas of the world, and the rapid expansion in numbers in recent years, cannot be ignored. It has been asserted that no country that cannot or will not use the combine can hope to grow wheat at world prices.

The English farmer asks about the straw. He states that he cannot afford to neglect the value of the straw, which in some cases during the past season has realized as much as the grain. In districts where there is a good market for bond tied straw, or where straw is required for thatching purposes, it must be admitted that the combine will not produce the goods. Where the straw is used for litter on the farm or is sold in bales for litter or packing purposes the difference in value in that produced by the usual binding and threshing methods and that resulting from the use of the combine is not very great.

Another query is "What about damp corn?" Some who have used the combine in England have been able to sell wheat direct to the miller and the sample has been considered satisfactory. It is admitted that during the 1930 harvest few of those samples could have been stored for any length of time. Fortunately engineering research and experiment in drying plants have so far advanced that efficient plants have now been designed for grain drying. Grain dried and cooled can be stored in bulk in good condition and need not all be marketed immediately after harvest. Experience so far has indicated that the English climate is not an insuperable

bar to the use of the combine. It has even been asserted that the combine is a better means of harvesting grain in catchy weather than the ordinary binding methods.

The grain must be fully ripe for easy threshing, and whereas ordinary binding and handling might, in such circumstances, cause a heavy loss in grain, the loss does not arise with the combine, and grain that reaches the platform is secured.

In upland and late districts where grain does not always ripen completely the combine may not be practicable. Small fields must also be a distinct disadvantage, but the idea of

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended June 12				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	10 0*d*	10 0*d*	10 0*d*	10 0*d*	12 11
Nitro-chalk (N. 15½%) ..	9 7*d*	9 7*d*	9 7*d*	9 7*d*	12 1
Sulphate of ammonia :—					
Neutral (N. 20·6%).. ..	9 10*d*	9 10*d*	9 10*d*	9 10*d*	9 3
Calcium cyanamide (N. 20·6%)	8 18*e*	8 18*e*	8 18*e*	8 18*e*	8 8
Kainit (Pot. 14%)	3 8*a*	2 19*a*	2 19*a*	3 3*a*	4 6
Potash salts (Pot. 30%) ..	5 6*a*	4 18*a*	5 0*a*	4 19*a*	3 4
„ (Pot. 20%) ..	3 17*a*	3 9*a*	3 8*a*	3 12*a*	3 7
Muriate of potash (Pot. 50%)..	9 17*a*	9 3*a*	9 2*a*	9 7*a*	3 9
Sulphate „ (Pot. 48%)..	11 19*a*	11 6*a*	11 5*a*	11 7*a*	4 9
Basic slag (P.A. 15¾%)‖ ..	2 10*c*	2 0*c*	..	2 6*c*	2 11
„ (P.A. 14%)‖ ..	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
„ (P.A. 11%)‖ ..	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	3 11	..	3 9	3 1	3 10
„ (S.P.A.13¾%)	3 5	2 15	3 3	2 15	4 0
Bone meal (N.3¾%, P.A.20¼%)	8 15	7 10	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	5 19*b*	5 5*f*	6 0	4 15	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, for delivery during the month, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

cutting and threshing on the same day warrants some attention even in the small field and on the comparatively small farm.

It is not inconceivable that small portable threshers and co-operatively owned drying plants for conditioning the grain may in the near future be the recognized mode of harvesting grain. The labour cost would be reduced, thatching would be dispensed with and the losses due to excessive handling of the crop from field to stack and from stack to thresher as well as the loss due to badly-built stacks and damp bottoms would be avoided ; nor should the prevention of the loss and damage caused by rats and mice in the stack be overlooked.

* * * * * *

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),
Principal, Moulton Farm Institute, Northampton.

Sheep Feeding Experiments.—The principles enunciated by the late Professor T. B. Wood for the feeding of sheep were in general similar to those recommended by him for cattle. The latter were discussed in this JOURNAL for April last (p. 101). The usual practice in regard to sheep feeding on roots is folding, the fold being moved from time to time to give the sheep the chance of eating greater or less quantities of roots according to the amount available. Hay, generally *ad lib.*, as a rule, is also given.

It has been shown by the results of various experiments, including those conducted by the Department of Agriculture, Leeds University, that the rate of fattening is accelerated when concentrated food is added to the ration.

Wood drew attention to the almost universal tendency among farmers to feed concentrated foods consisting mainly of cake. He considered such rations to be excessively high in protein. He suggested that excess of protein was the cause of many sudden deaths among sheep on roots in winter. The waste products of protein consumption are excreted by the kidneys and he was of the opinion that the extra work thrown on the kidneys by excessive protein consumption might cause serious derangement which in turn might result in sudden death. It is true that there is an absence of definite information to prove or disprove this theory. On the one hand, observation of practical results on numbers of farms appears to support it. On the other hand, it is maintained that no evidence in support has been forthcoming from the Yorkshire experiments.

For a sheep of 100 lb. live weight receiving a basal ration of 100 lb. roots and 5 lb. hay *per week*, Wood recommended a supplementary ration consisting of 1 part linseed cake and 10 parts barley or maize meal, or a mixture consisting of 1 part decorticated cotton cake and 10 parts barley or maize meal.

Those responsible for the Yorkshire investigations suggest that the results obtained from their series of experiments conducted over a number of years have shown that rations much richer in protein are apparently more satisfactory. There is certainly a wide difference in composition between the rations recommended by Wood and most of those employed in the Yorkshire trials with comparatively satisfactory results, as will be shown by an examination of the figures given below:—

PROFESSOR WOOD'S RATIONS

		Per lb.		
		Dry matter	*Starch equivalent*	*Protein equivalent*
1*	Linseed Cake	·85	·71	·08
10	Barley Meal			
1	Decorticated Cotton Cake	·85	·71	·09
10	Barley Meal			

YORKSHIRE EXPERIMENTS, 1929-30

PEN II

1	Decorticated Earthnut Cake	·89	·75	·23
3	Palm Kernel Cake			

PEN III

(*a*) 1	Decorticated Earthnut Cake	·89	·75	·23
3	Palm Kernel Cake			
(*b*) 1	Decorticated Earthnut Cake	·89	·74	·23
3	Palm Kernel Cake			
1	Linseed Cake			
(*c*) 2	Decorticated Earthnut Cake	·88	·73	·25
2	Linseed Cake			
1	Rolled Wheat			
1	Rolled Barley			

PEN IV

1	Rolled Wheat	·86	·72	·08
1	Rolled Barley			

PEN V

1	Undecorticated Cotton Cake	·90	·47	·14
3	Dried Brewers' Grains			

YORKSHIRE EXPERIMENTS, 1930-31

PEN I

1	Decorticated Earthnut Cake	·89	·75	·23
3	Palm Kernel Cake			

* All parts by weight.

		Per lb.		
		Dry matter	*Starch equivalent*	*Protein equivalent*
PEN II				
1	Decorticated Earthnut Cake	·88	·63	·16
3	Rolled Oats			
PEN III				
(*a*) 1	Decorticated Earthnut Cake	·89	·75	·23
3	Palm Kernel Cake			
(*b*) 1	Decorticated Earthnut Cake	·89	·74	·24
3	Palm Kernel Cake			
2	Linseed Cake			
(*c*) 2	Decorticated Earthnut Cake	·88	·69	·24
2	Linseed Cake			
2	Rolled Oats			
PEN IV				
1	Undecorticated Cotton Cake	·90	·47	·14
3	Dried Brewers' Grains			

Equal weights of the different rations were fed to all the pens in these experiments.

The ration employed for Pen IV in the trials of 1929–30 is the only one that approximates in composition to those recommended by Wood. The results obtained with this ration were poor in comparison with those obtained from others in the group, both when judged on the basis of live weight increase per day and on the financial returns. It is, therefore, possible that this mixture does not supply sufficient protein. The ration used for Pen II in the 1930–31 trials is comparable to rations used fairly extensively in commercial sheep feeding. The resulting figures tend to show that this ration did not compare very favourably with rations richer in protein, but in assessing the real merit of the different rations the fact that the Pen II ration was considerably lower in starch equivalent should not be overlooked. To secure strict comparison it would be necessary to feed the different rations not in equal weights of each, but in weights adjusted to supply similar quantities of starch equivalent in each case.

Throughout the series of Yorkshire experiments the cotton cake and dried grains mixture has given results that are rather striking when one allows for the fact that this ration is composed of what are usually considered to be low-grade foods, in the sense that they are not highly concentrated and have a starch equivalent low in comparison with the other foods employed. The results do not appear to indicate that sheep fed on this mixture found the ration to be deficient in protein.

It is significant that in the 1927–28 experiments, sheep fed on the concentrated ration given below fattened most quickly and most uniformly :—

Ration	Composition Per lb. Dry matter	Starch equivalent	Protein equivalent
1 Decorticated Earthnut Cake ..			
3 Palm Kernel Cake	·88	·73	·15
2 Wheat			
2 Barley Meal			

This would supply only very slightly more protein than the cotton cake and dried grains mixture, and it seems to the writer both from a study of experiments and from actual experience of sheep feeding on commercial lines that this ration may pretty nearly approach the correct balance for sheep up to 100 lb. live weight.

It will be readily realized that at the present time it is important for farmers to know just *how little* protein they may safely have in the sheep-fattening mixture. It becomes increasingly desirable to utilize home-grown cereals as fully as possible in stock feeding in preference to putting corn on the market. That cereals may require to be supplemented by some purchased protein-rich food is recognized, when the farmer has no beans or peas with which to make up protein deficiency, but it would be useful if we could have some more exact information regarding actual protein requirement, as existing information is obviously somewhat contradictory.

In addition to suggesting that excess of protein may be dangerous from the point of view of health, Wood made a second submission that the protein requirement of sheep does not materially increase after the sheep reaches 100 lb. live weight. The correctly-balanced ration, therefore, should aim at providing the required amount of protein at the 100 lb.-live-weight mark, and subsequently the amount of protein need not be appreciably increased. If with a ration supplying the requisite quantity of protein the farmer finds that his sheep of 100 lb. live weight and upwards are not making sufficient progress, his proper course would be to increase the starch equivalent of the ration—in other words, increase the amount of suitable home-grown or other starchy foods without increasing the protein-rich foods or cakes. If we accept Wood's theory, then the practice of increasing a protein-rich ration, as a whole, as the sheep increases in weight, would appear to be open to criticism. The correct and presumably more economical course would be to increase the starchy foods

only. In times of cheap oats, barley and wheat, this would appear to be the one most likely to commend itself to the arable-land farmer.

One, therefore, ventures to repeat that there is need for more exact information regarding the protein requirements of fattening tegs at various stages of growth, and to submit that it would be helpful if those engaged in sheep-feeding experi-

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Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 12
Maize	81	6·8	4 3
Decorticated ground nut cake	73	41·0	7 10
„ cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·27 shillings, and per unit protein equivalent, 1·70 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values " which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 8
Oats	60	7·6	4 9
Barley	71	6·2	5 1
Potatoes	18	0·6	1 4
Swedes	7	0·7	0 10
Mangolds	7	0·4	0 10
Beans	66	20·0	5 18
Good meadow hay	37	4·6	2 15
Good oat straw	20	0·9	1 7
Good clover hay	38	7·0	3 0
Vetch and oat silage	13	1·6	0 19
Barley straw	23	0·7	1 10
Wheat straw	13	0·1	0 16
Bean straw	23	1·7	1 12

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6*d.* net.

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	6 3	0 11	5 12	72	1 7	0·85	9·6
Barley, British feeding	—	—	5 15	0 9	5 6	71	1 6	0·80	6·2
„ Canadian No. 3 Western	20 6	400	5 15	0 9	5 6	71	1 6	0·80	6·2
„ Danubian	20 0	„	5 12	0 9	5 3	71	1 5	0·76	6·2
„ Persian	19 6	„	5 10*	0 9	5 1	71	1 5	0·76	6·2
„ Russian	20 3	„	5 13*	0 9	5 4	71	1 6	0·80	6·2
Oats, English, white	—	—	7 0	0 10	6 10	60	2 2	1·16	7·6
„ „ black and grey	—	—	6 5	0 10	5 15	60	1 11	1·03	7·6
„ Canadian No. 2 Western	20 3	320	7 2	0 10	6 12	60	2 2	1·16	7·6
„ „ No. 3 „	19 3	„	6 15	0 10	6 5	60	2 1	1·12	7·6
„ „ Mixed Feed	13 9	„	4 17*	0 10	4 7	60	1 5	0·76	7·6
„ Argentine	13 9	„	4 17	0 10	4 7	60	1 5	0·76	7·6
„ Chilian tawny	14 9	„	5 3	0 10	4 13	60	1 7	0·85	7·6
„ „ white	22 6	„	7 16	0 10	7 6	60	2 5	1·29	7·6
„ Russian	19 6	„	6 17	0 10	6 7	60	2 1	1·12	7·6
Maize, Argentine	18 0	480	4 3	0 9	3 14	81	0 11	0·49	6·8
Peas, Indian	—	—	8 0†	1 0	7 0	69	2 0	1·07	18
„ Japanese	—	—	18 5†	1 0	17 5	69	5 0	2·68	18
Dari	—	—	9 0	0 11	8 9	74	2 3	1·20	7·2
Milling offals—									
Bran, British	—	—	4 10	1 0	3 10	42	1 8	0·89	10
„ broad	—	—	5 10	1 0	4 10	42	2 2	1·16	10
Middlings, fine, imported	—	—	5 12	0 16	4 16	69	1 5	0·76	12
„ coarse, British	—	—	5 7	0 16	4 11	58	1 7	0·85	11
Pollards, imported	—	—	4 12	1 0	3 12	60	1 2	0·62	11
Meal, barley	—	—	6 15	0 9	6 6	71	1 9	0·94	6·2
„ maize	—	—	5 17	0 9	5 8	81	1 4	0·71	6·8
„ „ germ	—	—	5 15	0 14	5 1	85	1 2	0·62	10
„ locust bean	—	—	5 5	0 7	4 18	71	1 5	0·76	3·6
„ bean	—	—	8 7	1 3	7 4	66	2 2	1·16	20
„ fish	—	—	17 0	3 1	13 19	53	5 3	2·81	48
Maize, cooked flaked	—	—	6 10	0 9	6 1	83	1 5	0·76	8·6
„ gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	8 7	1 8	6 19	74	1 11	1·03	25
„ „ „ 9% „	—	—	8 0	1 8	6 12	74	1 9	0·94	25
„ „ „ 5% „	—	—	7 15	1 8	6 7	74	1 9	0·94	25
Soya bean cake, 5½% oil	—	—	7 12*	1 19	5 13	69	1 8	0·89	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	5 2	1 6	3 16	42	1 10	0·98	17
„ „ Egyptian, 4½% „	—	—	4 10	1 6	3 4	42	1 6	0·80	17
Ground-nut cake, 6-7% oil	—	—	5 17*	1 6	4 11	57	1 7	0·85	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 10	1 19	5 11	73	1 6	0·80	41
Palm kernel cake, 4½-5½% oil	—	—	6 5§	0 16	5 9	75	1 5	0·76	17
„ „ „ meal 4½% „	—	—	6 15§	0 16	5 19	75	1 7	0·85	17
Palm kernel meal, 1-2% „	—	—	5 2	0 17	4 5	71	1 2	0·62	17
Feeding treacle	—	—	5 5	0 9	4 16	51	1 11	1·03	2·7
Brewers' grains, dried ale	—	—	4 10	0 17	3 13	48	1 6	0·80	13
„ „ „ porter	—	—	4 0	0 17	3 3	48	1 4	0·71	13
Malt culms	—	—	4 10†	1 6	3 4	43	1 6	0·80	16
Dried sugar beet pulp (*a*)	—	—	4 2	0 8	3 14	65	1 2	0·62	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of May, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value

ments could devote more attention to the testing out of rations consisting of a restricted quantity of protein-rich food used in conjunction with cereals or other starchy feeding stuffs. Rations of this type are meeting with the approval of certain practical feeders, but it is desirable that they should be exhaustively tested under the more accurate and searching methods employed in properly controlled field experiments.

It is recognized that very valuable data have been accumulated after much painstaking and careful work in the Leeds University experiments, and one hopes that these investigations may be continued with the object of elucidating those points that are still obscure.

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Reports of Experiments on the Winter Feeding of Sheep. Department of Agriculture, Leeds University, Bulletin Nos. 153 (1928) and 163 (1929).

Proceedings of Sheep Farmers' Conference, Moulton, June 4, 1931. (Mr. G. C. A. Robertson.)

* * * * * *

MISCELLANEOUS NOTES

The Agricultural Index Number

THE general level of the prices of agricultural produce during May was 22 per cent. above pre-war, or one point below the level recorded in the previous two months and 12 points lower than in May, 1930. As in April, price changes were fairly numerous during the month, but the principal cause of the reduction of one point in the index number was the fall in the price of milk.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	—
July	48	42	45	41	34	—
August..	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Both wheat and oats were dearer, the former by 6*d.* and the latter by 7*d.* per cwt. and both cereals showed an increase of 4 points in their respective indices, wheat being 28 per cent. and oats 11 per cent. cheaper than in May, 1911-13. Barley, however, was 7*d.* per cwt. cheaper on the month and there was a drop of 8 points in the index to 10 per cent. below pre-war.

Live Stock.—Fat cattle were very slightly dearer than in April, but the index number was one point lower at 19 per cent. above the level of the base period. In the case of sheep, however, the movement was in an opposite direction, a reduction of ½*d.* to 10½*d.* per lb. for second quality being proportionately less than that which occurred in May, 1911-13. In consequence, the index showed a rise of 3 points to 40 per cent. above pre-war. The decline in the values of fat pigs continued during May. Baconers, which were on average 4*d.* per score cheaper, fell by 2 points to 21 per cent. above 1911-13 while porkers showed a reduction of 11*d.* per score, and were 7 points lower at 33 per cent. above. Store cattle again showed a slight increase in price, and the index advanced by 2 points to 25 per cent. above pre-war, but prices for dairy cows continued to recede, a fall of 14*s.* per head causing the index to decline by 4 points to 24 per cent. above 1911-13. Store sheep and pigs also were lower, the former by 3 points and the latter by 11 points. Since the commencement of the year, store pigs have fallen consistently and are now 62 points below the January level of 114 per cent. above pre-war.

Dairy and Poultry Produce.—The average contract price of milk in May was about ½*d.* per gallon below the April figure, and the index number was reduced by 6 points to 47 per cent. above 1911-13. Eggs were slightly cheaper on the month, but as an advance occurred in the base period, the index showed the considerable fall of 11 points to 7 per cent. above 1911-13. Butter and cheese were reduced to 8 per cent. and 22 per cent. respectively above pre-war. Fowls were unchanged in price, but ducks were dearer.

Other Commodities.—Potatoes maintained the high prices ruling in April and the index number was 3 points higher at 85 per cent. above the base period as compared with 36 per cent. below a year ago. Hay was slightly cheaper, but the index number was unaltered. The recently improved prices for wool were not maintained during May and a fall of about ¾*d.* per lb. caused the index number to decline by 5 points to 21 per cent. below pre-war.

Index numbers of different commodities during recent months and in May, 1929 and 1930, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	May	May	Feb.	Mar.	Apr.	May
Wheat	25	11	—31*	—30*	—32*	—28*
Barley	34	—1*	3	— 3*	—2*	—10*
Oats..	31	—11*	—18*	—18*	—15*	—11*
Fat cattle	32	30	25	23	20	19
,, sheep	57	63	37	30	37	40
Bacon pigs	81	61	31	24	23	21
Pork ,, ...	78	67	51	46	40	33
Dairy cows	32	29	32	30	28	24
Store cattle..	23	28	29	25	23	25
,, sheep..	51	46	35	31	31	28
,, pigs	81	108	98	75	63	52
Eggs	50	28	17	24	18	7
Poultry	65	64	44	47	42	63
Milk	57	55	62	50	53	47
Butter	50	23	16	18	15	8
Cheese	81	52	19	23	24	22
Potatoes	—3*	—36*	73	70	82	85
Hay	22	28	—10*	—9*	—10*	—10*
Wool	59	Nil.	—25*	—20*	—16*	—21*

* Decrease.

* * * * * *

Lectures in Tropical Hygiene

A FURTHER course of lectures and demonstrations in Tropical Hygiene has been arranged by the London School of Hygiene and Tropical Medicine for men and women (outside the medical profession) proceeding to the tropics.

The present series will be given by Lieut.-Colonel G. E. F. Stammers, O.B.E., M.R.C.S., L.R.C.P., D.P.H., from July 6 to 10.

These courses of instruction, in addition to providing simple rules for guidance in regard to preparation for life in the Tropics and personal hygiene, will also embrace a short account of some of the more common diseases, with advice as to measures of protection against such diseases and some guidance in simple methods of self-treatment.

The Synopsis and other particulars may be obtained from the Secretary, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C. 1.

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended March, 1931, compared with the corresponding period of 1930. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	Jan. to March, 1931		Jan. to March, 1930	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	62	13,100	23	2,757
Belgium	31	785	53	2,526
Brazil	5	600	0	0
Denmark	6	497	0	0
Mexico	0	0	10	700
Australia	32	3,015	50	5,823
British India	18	1,240	0	0
Hong Kong	0	0	19	800
Irish Free State	692	16,653	482	11,976
Southern Rhodesia	11	671	27	2,249
Union of South Africa	9	878	33	2,171
Other countries	11	532	10	1,084
Total	877	37,971	707	30,086
SHEEP AND LAMBS				
Argentina	57	1,380	131	3,100
Chile	0	0	16	1,140
United States of America	0	0	48	877
Australia	35	915	20	405
British India	53	483	0	0
Irish Free State	46	229	10	238
Kenya	4	165	0	0
Union of South Africa	120	1,095	2	55
Other countries	8	104	6	478
Total	323	4,371	233	6,293
SWINE				
Belgium	0	0	21	324
Egypt	0	0	75	275
Poland	74	1,110	0	0
Roumania	21	252	0	0
Spain	7	126	0	0
Yugoslavia	127	2,800	0	0
Australia	2	50	7	197
Hong Kong	15	338	0	0
Irish Free State	6	62	46	274
Southern Rhodesia	0	0	10	300
Other countries	15	478	8	263
Total	267	5,216	167	1,633

Farm Institute Livestock Judging Competition

THE fifth annual competition in the judging of livestock open to students of county farm institutes in England and Wales was held on June 11 on the farm of Mr. J. Timberlake, at Hastoe, Tring, Herts. These annual competitions are run under the auspices of the National Farmers' Union, and are managed by a Committee representative of the National Farmers' Union, the Royal Agricultural Society of England, the County Councils' Association and the Ministry. The judges, four in number, were again appointed by the Ministry in consultation with the Committee. They were Mr. E. C. Dickens, of Berkhamsted—gilts for breeding purposes and store sheep; Mr. Tom Fowler, of Tring—agricultural horses; Mr. J. Timberlake, of Hastoe—dairy cows; and Mr. Ernest Stevens, County Poultry Instructor for Buckinghamshire—utility poultry.

The classes of stock judged in this competition were half-bred Shire horses, Shorthorn dairy cows in milk, Middle-white gilt pigs, Border-Leicester-Cheviot cross sheep, and Rhode Island Red poultry. The stock in each class were both typical and characteristic, and were specially selected to provide full exercise of judgment. The judges placed the stock shown in order of merit before the competition started, and competitors were expected to decide what they considered the right order, directing their attention especially to commercial value rather than to breed points. There was a record entry of competitors this year, 10 out of the 17 county farm institutes entering. The teams, each consisting of three students, were allowed ten minutes to inspect, handle and place the animals in each class in order of merit, and a further ten minutes for giving in writing their reasons for so placing them. Afterwards each judge gave the reasons for his decisions.

The Hertfordshire Institute of Agriculture, which entered the competition for the first time, carried off the perpetual challenge cup provided by the National Farmers' Union. The Hertfordshire team secured a total of 289 marks out of a possible maximum of 365, the runners-up being Chadacre Farm Institute, Suffolk, with 268 marks, and the Northamptonshire Farm Institute with 265 marks. In addition to the foregoing, the following county institutes competed: Carmarthenshire, Cheshire, Cumberland and Westmorland, Hampshire, Monmouthshire, Staffordshire, and East Sussex.

The challenge cup was presented to the winners by Alderman E. W. K. Slade, President of the National Farmers' Union, at

a luncheon held after the competition, which was presided over by Lord Rothschild.

This was certainly one of the most, if not the most, successful competition that has so far been held. Mr. Timberlake's farm provided an excellent centre for the purpose, and he and Mr. J. B. Foster and Mr. L. Newman of the National Farmers' Union deserve the warmest praise for the excellence of the arrangements they made, which contributed in large measure to the success of the competition.

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Public Rights and Rural Commons

Now that the holiday season is upon us, much public interest will be taken in the position of commons and other open spaces in rural districts. Holiday-makers have been told, until the unoffending ones are tired of it, that it is wrong to leave litter and rubbish lying about, or in any way to disfigure the surface of the soil. The Ministry often receives complaints from Lords of Manors and other persons entitled to the soil of country commons—subject, of course, to the exercise of the rights of common—that these lands are disfigured or spoiled by persons lighting fires and camping on them, driving vehicles over them, or otherwise using them badly. In reply to such complaints, the Ministry has found it necessary to point out to those persons that they, as Lords of the Manor, can make a Deed of Declaration which, while allowing the public right of access for air and exercise, renders persons who unlawfully drive vehicles over the common, or camp upon it, or light fires on it, liable to penalties. Some landowners are taking the course of making such Deeds, and it is worth while to point out that after they are made the Ministry can, if necessary, limit the exercise of the public right of access so as to prevent the interests of the owners of the soil or of the common rights from being prejudiced through other causes in addition to those already mentioned.

Lords of Manors and others in ownership of the common and its rights would probably have no objection to agreeing to the full grant of public access for air and exercise to rural commons, provided that this right was not abused, and the Ministry will be ready to supply any inquirers with information and directions as to the procedure which should be adopted to achieve this result. Letters in this connexion should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

International Dairy Congress, 1931

THE Ninth International Dairy Congress will be held in Copenhagen during the present month under the patronage of H.M. the King of Denmark. The Congress will be opened on Tuesday, July 14, and paper-reading sessions will be held each morning until Friday, July 17. Following the sessions, a series of tours has been arranged in order that delegates may study Danish methods of dairy farming and become acquainted with the organization of the dairy industry and of the educational institutions.

The paper-reading sessions have been divided into five sections, as follows :—

(1) Dairy cattle breeding and milk production.
(2) Chemistry, bacteriology and hygiene.
(3) Technique, industry and trade.
(4) Organization, legislation and control.
(5) Tropical dairy industry.

The Danish Government, through the Foreign Office, approached H.M. Government to appoint delegates to represent the British Dairy Industry at the Congress. In response to this invitation, 24 delegates of the Industry have been appointed, while H.M. Government will be represented by officers of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland, the Ministry of Agriculture for Northern Ireland and the Ministry of Health.

The Official Correspondent in England and Wales on matters relating to the Congress is Mr. A. D. Allen, O.B.E., 28 Russell Square, London, W.C.1, by whom arrangements for the transport and accommodation of the British delegation have been made. It is understood that the Organizing Committee of the Congress anticipate the attendance of delegates from about fifty countries.

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The R.A.S.E. Research Medal

THE Royal Agricultural Society of England's Research Medal for original agricultural research work is, this year, again offered for award. This Silver Medal, with an addition of money or books to the value of ten pounds, will be awarded for a monograph or essay giving evidence of a candidate's original research on any agricultural subject, or on any of the cognate agricultural sciences, or on agricultural economics. It must be signed by the candidate as his own genuine work. Candidates for the Medal must reside in Great Britain or Ireland, and must not be more than thirty years of age on September 29, 1931. The monographs or essays, either typewritten or printed, must be forwarded to reach the Secretary of the Society, 16, Bedford Square,

London, W.C.1, on or before October 31, 1931 They will be adjudged by Referees appointed by the Council of the Society. If, in the opinion of the Referees, no monograph or essay submitted is found to attain a sufficient standard of excellence, the Society will be at liberty to reserve the Medal for award as an additional Medal in some subsequent year. The monograph or essay of the successful candidate will be published in the *Journal of the Royal Agricultural Society* if, in the opinion of the Council, it is suitable for that purpose. Essays already published will not be eligible for the Medal.

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Prize for Improving Agriculture in the Punjab

IN the issue of this JOURNAL for July, 1929, particulars were given of the Maynard Ganga Ram Prize, founded through the generosity of the late Sir Ganga Ram, C.I.E., M.V.O., who presented the Punjab Government with a sum of 25,000 rupees as an endowment for this prize of 3,000 rupees, to be awarded triennially for a discovery, or an invention, or a new practical method which will tend to increase the agricultural production of the Punjab on a paying basis. The Prize is open for world-wide competition and Government servants are eligible to enter for it.

The first offer of the Prize was made in the year above mentioned, and as a result, sixty-four entries were received, but of this number only fourteen complied with the conditions of award. Four committees of judges were appointed to examine and report on these applications, and their reports were considered finally by the Managing Committee of the Prize, when it was decided to award the prize to Dr. C. A. Barber, C.I.E., of Cherryhinton Road, Cambridge, for his fundamental discoveries that have resulted in the production of Coimbatore seedling sugar canes. These canes have been definitely proved to be much higher yielders under Punjab conditions than the old, indigenous varieties. The area under Coimbatore sugar canes is increasing rapidly each year, and it is expected that, in a few years' time, they will entirely replace the indigenous varieties.

The second competition for the Maynard Ganga Ram Prize will be held next year, and applications for the award should reach the Director of Agriculture, Punjab, Lahore, India, on or before December 31, 1932. Concerning this second award, an announcement will be found in the advertisement pages of this issue of the JOURNAL.

Poultry-Keeping on the Farm

THE following further note has been communicated by Mr. E. Rea, N.D.A, N.D.D., the Agricultural Organizer for Middlesex :—A note in the May, 1931, issue of this JOURNAL (p. 217) drew attention to the advantages of a simple system of farm poultry-keeping, using portable slatted-floor houses and portable runs. The thousand-bird, slatted floor demonstration in Middlesex had a humble beginning and was the outcome of successful small-scale experiments conducted at the County Egg-Laying Trial during the three years, 1927-30. These experiments indicated that laying-stock on slatted floors were healthy even in severe weather and produced rather more eggs than control birds of the same strain that were reared, fed and kept in laying-trial houses. The Middlesex Agricultural Education Committee, therefore, welcomed the generous offer of Sir John FitzGerald to finance a commercial demonstration, under the Committee's supervision, covering two complete laying seasons from October 1, 1930, to September 30, 1932. The Economics Department of Reading University kindly consented to keep cost accounts throughout.

Lay-out of Plant.—a suitable site of five acres was made available by Sir John FitzGerald at Stanmore, and a "one-man" plant, consisting of 20 houses and runs and 1,000 first-cross pullets, was installed. As sufficient land was not available to move the entire plant annually, four additional houses and runs were kept in reserve to allow one-fifth of the plant always to be empty. Thus each house and run receive 10 weeks' rest in the year. The houses, which are designed to accommodate 50 birds each, are 8 ft. by 7 ft., and 7 ft. 6 in. high to the ridge, mounted on four iron wheels, and fitted with removable, slatted floors, galvanized-iron dropping trays, ribbed-glass roof-lights, eave and ridge ventilation, with inside food-troughs, water-troughs and nests.

Each house is thus self-contained and stands in a wire-netted run of one-fifth of an acre, in which is provided a simple "universal" wind shelter consisting of three wattle hurdles set up in "Y" formation. The wire runs are 4 ft. 6 in. high, easily erected and portable, and, to aid service, simple gates, consisting of one fixed and one loose post, clipped together at the top like sheep hurdles, give access to gangways and to the adjoining runs. A food-store, office, covered manure-shed, food and manure trolleys, water barrow and portable pump, with all necessary small equipment, were also

provided. Accommodation for broodies and isolation consist of a series of small (6 ft. by 3 ft.) night arks in separate wire runs.

Livestock.—1,045 three-month-old, first-cross pullets were purchased during July, 1930. These comprised 900 White Leghorn × White Wyandotte and 145 White Leghorn × Rhode Island Red, and they were placed in units of 50 in the houses they were to occupy later as layers. The Leghorn-Rhode Island cross had been bred with a Leghorn male, but the Leghorn-Wyandotte birds were crossed both ways. The stock was obtained from pedigree breeders on the recommendation of county poultry instructors, who gave valuable assistance in obtaining pullets that could not be ordered until late in the season. The average price paid for pullets was 5*s.* 10*d.*, and they cost another 2*s.* 2*d.* per head for food, labour and depreciation to rear to maturity, thus giving a total cost per head of 8*s.* on October 1, 1930.

Management.—A manager was placed in charge of the Demonstration. Feeding and management followed simple and conventional lines, mixed grain and dry mash being given during the rearing period. One-third of the grain was fed in the morning and two-thirds at night, scattered in the rough grass until the runs showed signs of wear, when it was trough-fed. Dry mash hoppers were open all day. During August, the flock was inoculated with Fowl-Pox vaccine supplied by the Ministry of Agriculture Veterinary Laboratory, and although a number of autumn colds occurred, no lesions of fowl-pox were observed. In October, the rations were slightly modified and made more concentrated to encourage egg production, and 1 oz. of wet mash per bird was introduced at mid-day. Once the birds had settled down to steady production, early in February, the ration was made slightly less forcing by replacing fish meal by meat and bone meal in the mash; otherwise rations remained unaltered from October 1 to March 31. Daily food consumption steadily increased with egg production, and during the three quarterly periods under review averaged as shown in Table 1.

TABLE I

DAILY FOOD CONSUMPTION AND COST: OZ. PER HEAD.

	Grain	*Mash*	*Total*	*Cost per cwt.*
July-September, 1930 ..	1·26	2·02	3·28	8*s.* 5*d.*
October-December, 1930	2·08	1·92	4·00	8*s.* 5½*d.*
January-March, 1931 ..	2·28	2·13	4·41	6*s.* 8½*d.*

Early in January, when the runs were bare, mangolds were fed twice weekly, cut in halves. A ton lasted until the end of March.

TABLE II

RATIONS: OCTOBER, 1930—MARCH, 1931 (PARTS BY WEIGHT).

Grain		*Mash*	
Kibbled maize	1	Fish Meal	10*
Wheat	1	Dec. groundnut meal	5
		Broad bran	10
		Maize germ meal	15
		Sussex ground oats	20
		Middlings, fine	20
		,, coarse	20

*Meat and bone meal substituted as from February 1, 1931.

A mineral mixture, consisting of

Sterilized steamed bone flour	60 per cent.
Ground chalk	20 ,,
Common salt	20 ,,

was included to the extent of 2 per cent. of the mash (parts by weight).

Egg Production.—During October and early November, last year, egg production was disappointing on account of—

(I) Late hatching: as the demonstration was not planned until March, 1930, it was not possible to obtain 1,000 early pullets of the required cross.

(II) Check in development: the young pullets became so accustomed to living outdoors that they were disinclined to go in even to feed. Dry mash consumption fell considerably during the rearing period and, although the mash hoppers were placed outside, the flock suffered a check before coming into lay. Immediately the hoppers were placed out-of-doors, dry mash consumption returned to the normal, and although out in all weathers, the effect of rain was merely to make the mash more palatable and temporarily to increase consumption.

Although the flock did not come into the production stage until November, a high winter egg-output was maintained and no autumn moulting occurred.

TABLE III

EGG PRODUCTION, OCTOBER 1, 1930—MARCH 31, 1931.
(Stock at October 1, 1,024.)

Month	*Eggs sold*	*Daily Average*	*No. of living birds at end of month*
October	1,789	57	1,015
November ..	7,113	237	1,009
December	16,764	541	1,001
January	19,191	619	987
February	17,709	632	968
March	20,276	654	956
Saleable eggs ..	82,842	455	
Defectives ..	1,777	9·7	
Total eggs ..	84,619	464·7	

The 1,045 pullets purchased in July were culled down to 1,024 on October 1, after which date all birds appearing sick were immediately isolated. After a short quarantine, they were either killed, sold or returned to their pens. This rigorous

culling has raised the disposals to 68 in six months, and, whilst a mortality of 7 per cent. in this period appears high, practical farmers will agree that the policy is justified. "Defective" eggs, noted in the above table, include all eggs broken in nest or on slats, soft-shelled eggs or those unfit for sale. Thus the margin of 2 per cent. between egg sales and total eggs is not excessive.

Manure Disposal.—The night droppings are collected on metal trays placed 10 in. below the slats and slightly below the bottom of the walls of the houses, so that they are kept reasonably dry. No objectionable smell is noticeable inside the houses even when the trays are only cleaned weekly. The droppings, when collected, are stored in the covered manure shed, but, although air dried under the houses, are not sufficiently free from moisture to prevent heating when stored. The manure shed is, therefore, cleaned every three months, and the manure spread by shovel over grass land.

A series of rotational grazing plots is available on the estate at Stanmore, and the plots are normally dressed annually in February with 1 cwt. sulphate of ammonia per acre. Each plot is approximately 7 acres in extent, and during February last one plot received 5 cwt. of poultry droppings (about 10 lb. of nitrogen) per acre instead of the 7 cwt. sulphate of ammonia, costing about £3 10*s*. It is estimated that one year's stored droppings should be sufficient to dress 15-20 acres, replacing sulphate of ammonia to the value of £7 10*s*. to £10. Although the poultry manure plot only received half the amount of nitrogen given to the sulphate of ammonia plots, the herbage is, so far, quite as good and abundant.

Summary of Results to March 31, 1931.—It is not possible to discuss results in great detail at this stage of the investigation, as it does not conclude until September 30, 1932, but two points that have so far emerged may be of use to others about to take up slatted floor housing. These concern inside food hoppers and eave ventilation, respectively.

(1) Inside food hoppers do not appear to be advisable, and a better system would be to raise the house-floor sufficiently high to place food and water hoppers underneath the house, where they can readily be protected from sun, rain and other farm stock.

(2) During the winter, the 2 in. eave ventilation was found to be excessive, and had to be discontinued entirely. With the adequate under-ventilation provided in slatted-floor houses, ridge ventilation appears to be the only form necessary in

the upper part, and the inclusion of any opening at the eaves is likely to be detrimental.

It is hoped to submit further progress statements as the Demonstration proceeds.

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Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held on June 2, 1931, at 7 Whitehall Place, London, S.W.1, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders carrying into effect the Committees' decisions.

Dorset.—An Order fixing minimum and overtime rates of wages to come into operation on June 7, 1931 (*i.e.*, the day following that on which the existing rates are due to expire), and to continue in force until June 11, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 31 hours in the week in which Christmas Day and Boxing Day fall and 44 hours (instead of 42 hours as at present) in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, with in addition in each of those weeks not more than three hours' employment in connexion with milking and the care of and attendance upon stock on each public holiday. In any other week in winter the minimum weekly wage is payable in respect of 48 hours and in any other week in summer in respect of 53½ hours (instead of 51 hours as at present). The overtime rate for male workers of 21 years of age and over is 8*d.* per hour. In the case of whole-time female workers of 21 years of age and over the minimum rate is 24*s.* per week of 31 hours in the week in which Christmas Day and Boxing Day fall and 39½ hours in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, with in addition in each of these weeks not more than three hours' employment in connexion with milking and the care of and attendance upon stock on each public holiday. In any other week the minimum weekly wage is payable in respect of 48 hours. The overtime rate for whole-time female workers of 20 years of age and over is 6*d.* per hour. In the case of part-time and casual female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6*d.* per hour.

Hampshire and Isle of Wight.—(1) An Order cancelling as from June 20 the existing minimum and overtime rates and fixing fresh rates to come into operation on June 21, 1931, and to continue in force until December 19, 1931. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* 6*d.* per week of 53½ hours in summer (instead of 51 hours as at present) and 48 hours in winter with overtime at 8*d.* per hour except in the case of overtime employment of carters, cowmen, shepherds or milkers in connexion with the immediate care of animals in which case the overtime rate is 7½*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour for all time worked.

(2) An Order fixing special differential rates of wages for overtime employment of male workers on the corn harvest in 1931, the rate in the case of such workers of 21 years of age and over being 9*d.* per hour.

Hertfordshire.—(1) An Order fixing special differential rates of wages for overtime employment on the hay harvest in 1931, the rate in

the case of male workers of 21 years of age and over being 10*d.* per hour and in the case of female workers of 19 years of age and over 7¾*d.* per hour.

(2) An Order fixing special minimum rates of wages for employment on the corn harvest in 1931, the rates in the case of workers of 21 years of age and over being, male workers 10*d.* per hour and female workers 7*d.* per hour.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ending June 14 legal proceedings were instituted against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Chester ..	..Knutsford ..	5 3 0	1 11 0	18 6 0	2
Derby ..	..Ashbourne ..	—	6 6	42 9 1	1
,,	,,	—	1 1 0	17 15 0	2
,,	,,	—	1 11 6	68 15 0	3
,,	,,	—	10 6	26 6 3	1
Lincoln (Kesteven and Lindsey) ..	Sleaford ..	1 0 0	—	3 5 0	1
Stafford ..	..Uttoxeter ..	2 10 0	2 6	8 1 2	1
Glamorgan	..Port Talbot	*	—	—	2
		£8 13 0	£5 3 0	£184 17 6	13

* Case dismissed.

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Foot-and-Mouth Disease.—At the time of going to press with this issue 46 outbreaks of Foot-and-Mouth Disease have been confirmed in Great Britain during the 10 days, June 17-26 (both dates inclusive).

On June 17, Foot-and-Mouth Disease was confirmed on a farm in Westmorland and on two farms near Preston, Lancashire, and, on the following day, 10 further outbreaks were confirmed in England, namely, in Lancashire, North Riding of Yorkshire and Westmorland. On June 19, in addition to three cases occurring in England, three were found to exist in the County of Perth. At the present time outbreaks have occurred in the counties of Cumberland, Durham, Lancashire, Westmorland and the North Riding of Yorkshire in England, and in Angus, Fife, Kincardine, Kirkcudbright and Perthshire and Kinross in Scotland. In all the cases confirmed on the first three days of the above-named period, the affected animals had been recently imported from Ireland.

On June 19, the Ministry of Agriculture for Northern Ireland reported that Foot-and-Mouth Disease had been found to exist in County Down, and, up to the present time, 10 separate outbreaks of the disease have been confirmed in that county.

Infected areas were declared round all the premises on which the outbreaks occurred and, in view of the recent wide movements of Irish animals through markets, an Order was made on June 19 prohibiting all movements of cattle, sheep, goats and swine in Great Britain except by licence, and prohibiting all markets, sales and exhibitions of such animals except licensed markets and sales of fat stock for immediate slaughter. This Order has been made with a view to prevent a widespread epidemic of the disease, and the situation

is being closely watched with a view to modifying the Order as soon as circumstances warrant.

On June 17, the Minister made an Order prohibiting the importation of cattle, sheep, goats and swine from Ireland.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Cumberland and Westmorland : Miss L. C. Ball, N.D.D., has been appointed Itinerant Instructress in Dairying, *vice* Miss F. Coward.

Gloucestershire : Mr. E. Rea, N.D.A., N.D.D., has been appointed Agricultural Organizer, *vice* Mr. G. H. Hollingworth.

Herefordshire : Mr. C. Savidge has been appointed Instructor in Horticulture, *vice* Mr. A. J. Manning.

Lincolnshire (Holland) : Mr. J. Hargrave, B.Sc., has been appointed Assistant Agricultural Chemist, *vice* Mr. F. W. Handley, B.Sc., Ph.D., promoted.

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NOTICES OF BOOKS

The Eugenics Review. Vol. XXIII, No. 1, pp. 100. (London : Macmillan & Co., Ltd. Price 3s.)

Necessarily much of the matter contained in this periodical has no direct bearing on agriculture. Stockbreeders and dairy farmers, however, will be interested in an article by Mr. A. D. Buchanan Smith on "Mendelism and Farm Stock," with special reference to the inheritance of milk-yield. Concerning legislative measures for the elimination of defective livestock, the author writes : "The success which has attended such legislation, both in Northern and Southern Ireland, has convinced many that if the rest of Great Britain were to adopt such 'scrub bull' legislation, it would be followed by an immense improvement in the quality of our cattle." Again, "the effect of the Stallion Licensing Act of 1919 is now being felt. No person qualified to give an opinion can be found to condemn that Act. The percentage of defective horses has fallen greatly. By merely eliminating the defective sires the average quality of the stock can be improved." Among other contributions may be mentioned an article by Sir J. Arthur Thomson entitled "Warnings from Nature," and a paper by J. A. Mjöen on "Race-Crossing and Glands" read at the recent meeting of the International Federation of Eugenics Organizations.

Bacteriological Control of Milk. A practical guide for media preparation and milk testing. By A. G. House. Pp. 60, with 29 illustrations. (The National Institute for Research in Dairying, University of Reading, Shinfield, near Reading. Price, 3s. 6d., post free, 3s. 10d.)

The author of this book is a member of the National Institute for Research in Dairying and his aim is to supply those who are charged with the equipment of a bacteriological laboratory or who are required to undertake bacteriological analyses of milk with practical information of a detailed character concerning requirements and methods. The book opens with a note on accommodation and equipment for bacteriological laboratories. This is followed by an account of the sterilization of glassware. The chapter on media gives a detailed but nevertheless concise account of the preparation of the different media, together with general observations on media room management. The preparation of sampling outfits is dealt with and the various methods of milk testing are described. At the end of the book are given accounts of the preparation of concentrated litmus and standard solutions, and there is also a list of laboratory furnishings and apparatus.

Dr. Stenhouse Williams, the Director of the Institute, in his foreword to this book, writes: "Mr. House's long experience in work of this kind makes him peculiarly well qualified for the preparation of this monograph."

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ADDITIONS TO THE LIBRARY

Botany

Onslow, Muriel W.—The Principles of Plant Biochemistry. Part I. (326 pp.) Cambridge: at the University Press, 1931. 16s. [54; 58.]

Carnegie Institution of Washington.—Publication No. 398:—Plant Competition: An Analysis of Community Functions, by *F. E. Clements, J. E. Weaver* and *H. C. Hanson.* (340 pp. + 32 plates.) Washington: 1929. [58.11; 58.3.]

Lundegardh, H.—Environment and Plant Development. Translated and Edited from the Second German Edition by *E. Ashby.* (xii + 330 pp. + 8 plates.) London: Arnold, 1931. 24s. [58; 58.3; 63.161.]

Royal Horticultural Society.—Index Londinensis to Illustrations of Flowering Plants, Ferns and Fern Allies, being an Emended and Enlarged Edition continued up to the end of the year 1920 of *Pritzel's* Alphabetical Register of Representations of Flowering Plants and Ferns. Prepared under the auspices of the Royal Horticultural Society of London at the Royal Botanic Gardens, Kew, by *O. Stapf.* Vol. IV. Kadsura to Pedicellia (568 pp.) and Vol. V. Pedicularis to Sapium (549 pp.). Oxford: at the Clarendon Press, 1931. £5 5s. 0d. each vol. [58.2.]

Plant Pests and Diseases

Report of the Third Imperial Entomological Conference, June, 1930. (59 pp.) London: Imperial Institute of Entomology, 1930. 2s. [63.27; 63.292.]

Smith, K. M.—A Text Book of Agricultural Entomology. (285 pp.) Cambridge: at the University Press, 1931. 12s. 6d. [63.27.]

Elliott, Charlotte.—Manual of Bacterial Plant Pathogens. (ix + 349 pp.) London: Bailliere Tindall & Cox, 1930. 22s. 6d. [63.2; 63.23.]

Raum, H.—Die Wiesenunkräuter und ihre Bekämpfung einschliesslich die Wiesendüngung. (75 pp. + 8 plates.) (2nd edition). Freising-München: F. P. Datterer et Cie., 1929. [63.259.]

Land Drainage and Reclamation

Dobson, A., and *Hull, H.*—The Land Drainage Act, 1930. (xxiii + 154 pp.) Oxford: at the University Press; London: Humphrey Milford, 1931. 14s. [63.14.]

Etcheverry, B. A.—Land Drainage and Flood Protection. (x + 327 pp.) London: McGraw-Hill Publishing Co., 1931. 15s. [63.14.]

Du-Plat-Taylor, F. M.—The Reclamation of the Land from the Sea. (xv + 153 pp. + 15 plates.) London: Constable, 1931. 21s. [63.12.]

Machinery

World Agricultural Tractor Trials, 1930. Under the auspices of the Royal Agricultural Society of England in conjunction with the Institute of Agricultural Engineering, University of Oxford. Official Report on Tests and Catalogue of Machines taking part in the Public Demonstration at Ardington, near Wantage, September 16-19, 1930. Oxford: Hall, The Printer, 1930. 1s. [63.175.]

Board of Education, Science Museum.—Handbook of the Collections Illustrating Agricultural Implements and Machinery, by *A. J. Spencer* and *J. B. Passmore.* (95 pp. + 16 plates.) London: H.M. Stationery Office, 1930. 2s. [63.17.]

Horticulture

IXth International Horticultural Congress, 1930. Report and Proceedings, August 7-15, 1930. (450 pp. + 2 plates.) London: Royal Horticultural Society, 15s. [63.41; 63.5.]

Imperial Bureau of Fruit Production.—Proceedings of the First Imperial Horticultural Conference, 1930.

Part I. Papers on the Economic and Administrative Side of Horticulture. (36 pp.) 1s.

Part II. Papers on the Application of Science to Horticulture. (58 pp.) 2s.

Part III. Papers on Progress in Fruit Storage Methods. 2s. 6d. East Malling: 1931. [37.635; 63.41.]

Royal Horticultural Society.—Classified List of Daffodil Names, with Particulars of the Society's Classification of Daffodils and Arrangements for the Registration of Daffodil Names. (189 pp.) London: 1931. 1s. [63.522.]

Boyce Thompson Institute for Plant Research.—Professional Papers, I., No. 18:—Carbon Dioxide Storage of Fruits, Vegetables and Flowers. (pp. 137-144.) Yonkers, N.Y., 1930. [63.41-198; 63.51-198; 63.522.]

Live Stock and Feeding

British Friesian Cattle Society.—History of British Friesian Cattle. (552 pp.) London: British Friesian Cattle Society, 11 Southampton Row, 1930. 7s. 6d. [63.62; 63.711.]

Imperial Bureau of Animal Nutrition.—Index of Research Work on Animal Nutrition Throughout the Empire. (83 pp. mimeograph.) Aberdeen: 1931. [37 (072; 612.394; 63.6043.]

Parkinson, S. T., and *Fielding, W. L.*—The Microscopic Examination of Cattle Foods. (97 pp. including 15 plates.) Ashford and London: Headley Bros., 1930. 6s. 6d. [543.1; 58; 63.62:043; 63.60432.]

United States Department of Commerce.—Fisheries Document No. 1090:—Fish Meal in Animal Feeding, with Bibliography. (pp. 371-407.) Washington, 1930. [63.60432.]

British Columbia Fisheries Department.—Edible Fish-Meal. Its Composition and Value with Instructions for Its Use in Feeding Cattle, Swine, Sheep and Poultry. Edited by *Rodney De Lisle.* (80 pp. + 3 plates.) Victoria, 1930. [63.60432; 63.60433.]

Empire Marketing Board.—E.M.B. 35:—The Relative Values of Cod Liver Oils from Various Sources, by *J. C. Drummond* and *T. P. Hilditch.* (135 pp.) London: H.M. Stationery Office, 1930. 1s. [612.39; 612.394; 63.60432; 63.60433.]

Shaw, T. J.—The Summer Feeding of Live Stock with special reference to Dairy Cows. (29 pp.) Liverpool: R. Silcock & Sons, 1930. [63.6043; 63.711; 043.]

Whyte, W.—The Sheep-Dog. Judging and Conduct of Trials and the Art of Breaking-in. (viii + 186 pp. + 13 plates.). Auckland: Whitcomb & Tombs, n.d. 3s. 6d. [63.67.]

Ash, E. C.—The Practical Dog Book. (xxxii + 343 pp. + 44 plates.) London: Simpkin Marshall, 1930. 21s. [63.67.]

Institut International d'Agriculture.—Atlas International Zootechnique. Vol. I. Atlas International des Bovins.

(1) Allemagne. (63 pp. + map.) 30 lire.

(2) Pays-Bas. (45 pp. + map.) 25 lire.

(3) Hongrie. (56 pp. + map.) 25 lire.
(4) Suisse. (49 pp. + map.) 25 lire.
Rome: Bestetti & Tumminelli, 1930. [63.6 (4).]

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House, A. G.—Bacteriological Control of Milk. A Practical Guide for Media Preparation and Milk Testing. (59 pp.) Published by the Author at the National Institute for Research in Dairying, Shinfield, 1931. 3s. 6d. [543.2; 576.8:7; 63.712.]

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Worcestershire County Council.—Agricultural Education Sub-Committee. Ox Warble Fly. Report on the Demonstrations and Experiments, 1930. (47 pp. + 2 plates.) Worcester, 1930. [59.169; 619.2.]

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NOTES FOR THE MONTH

Binder Twine from East African Sisal

THE following note has been communicated by Mr. Alfred Wigglesworth, Chairman of the East African Sisal Producers' and Importers' Sub-Section of the London Chamber of Commerce (Inc.) :—

Notwithstanding the adoption of the Combine-Harvester-Thresher by farmers in certain countries that enjoy a dry climate during the harvest season, binder twine is likely to prove an indispensable product for farmers for many years to come. It is, therefore, of paramount importance that consumers of this article should understand the properties of the twine they are using, and if possible know what fibre is used in its manufacture.

Since binder twine was first made many fibres have been tried, and soft fibres such as Russian, Italian and Flax made a serviceable twine, but use in the field proved the superiority of sisal as a fibre for the manufacture of twine, largely because of its reasonable price and the clean cutting in the machine, as contrasted with the broken ends when twine was made from soft fibres.

The rapid extension in the use of self-binders throughout the vast plains of America and Canada coincided with an equally rapid increase in the area of sisal under cultivation in the province of Yucatan in Mexico.

The twine was manufactured from the fibre *Agave fourcroydes* Lemaire, one of some two hundred species which are indigenous in that country, and the cheap labour available at that time, and the comparatively low cost owing to the land being valueless except for fibre cultivation, enabled the growers to produce a fibre at competitive prices which left a sufficiently satisfactory profit to provide capital for further extension of the industry.

It was not until the latter part of last century that plants of *Agave sisalana* Perrine were imported from Florida into German East Africa, where they reproduced in a satisfactory way, and some fifteen years later plants were introduced into the Dutch East Indies, Java, and later still into Sumatra. Improved machinery and well organized plantations resulted in the quality of the African and Java fibre turning out superior to

anything that had been grown in Mexico, and this fibre rapidly grew in favour, until in 1929 and 1930 the combined production of these two areas exceeded that of Mexico.

African sisal possesses a distinct advantage for the manufacture of binder twine, being less smooth than the Java variety, thus lending itself better to spinning. Further, its freedom from dust and impurities gives a 6 to 8 per cent. better yield in the spinning compared with Mexican, and makes a twine which for regularity of spin, and light cream to white colour, is highly esteemed, especially in South America where colour proves an attractive feature in the purchase of this and many other articles.

Before the advent of African sisal, considerable quantities of Manila (*Musa textilis* Nees) were used for the manufacture of binder twine. This material is sorted into some twenty grades, and competition forced manufacturers to use one of the medium or lower medium grades for its manufacture. This material is of a dingy light-brown or dark-yellow colour, and for some time subsequent to the introduction of sisal it became a practice to dye the sisal so that the appearance of the twine might not vary to any great extent from that of the Manila which the farmer had been accustomed to buy. It is probably owing to this fact that the British farmer is not always aware when he is purchasing twine made from African sisal, which is now recognised as the best fibre for this particular purpose, and once it is generally known that African sisal has a greater purity than either Manila or Mexican, that the twine is of brighter colour and of better appearance, and that the level spin of the fibre cannot be improved upon, there can be little doubt that consumers will find it to their advantage to insist that their twine shall be made from this high-class fibre. The colour of East African sisal should be of great advantage. The old-fashioned twine was the same colour as the straw, and was very liable to be overlooked and to become mixed with it when fed to stock.

There is another advantage in connexion with African sisal; that the same breaking strain can be secured from a thinner twine in African than if it should be spun from Mexican, so that it has become customary to spin the Mexican fibre 500 ft. to the lb., while African is equally satisfactory at 550 ft. to the lb. and is occasionally spun 600 ft. or 650 ft. to the lb. This means a saving of 10 per cent., 20 per cent. or 30 per cent. in the runnage of the twine. The practice of winding twine into " cheeses " of about double the weight of the old-fashioned balls provides a larger quantity of twine in th

boxes, and therefore fewer stops are necessary for reloading with twine.

Altogether it may safely be said that improvements in the spinning, balling and general make-up of African twine are such as to ensure that this article should for many years continue to have a preference where reapers and binders are used. Fortunately, the production has kept pace with the demand and there has been no scarcity of fibre, which was in steadily increasing demand for binder twine, ropes and ply twine; indeed, not until the great slump, when manufacturers ceased to hold their customary stocks of raw material, did sisal fall in price. It is significant that the decline in value was not accompanied by any increased stock of African sisal, which has gone steadily into consumption, and has to be ordered in advance by manufacturers who require to lay in their store of raw material several months ahead, so that they may have their twine ready for the harvest.

There is the further advantage, in these days of Empire preference, that by purchasing twine spun from African sisal the farmer is assisting British Colonies whose monetary receipts are in turn largely spent in Great Britain, and thus help to support our home industries.

* * * * * *

"Nutrition Abstracts and Reviews"

DURING the past few years, important developments have taken place in nutrition research and in its application to human and veterinary medicine and to animal husbandry. Reports of the increasing volume of work now being done in this field appear in a wide range of journals devoted to various branches of pure and applied science, but few among the growing number of research workers and others interested in nutrition have access to all the publications dealing with the subject.

To meet the need for comprehensive and up-to-date information, the Imperial Agricultural Bureaux Council, the Medical Research Council, and the Reid Library are collaborating in the issue of a journal in which an attempt will be made to collect abstracts of all papers having a bearing on nutritional problems. A Committee of Management has been appointed, under the chairmanship of Mr. W. A. Reid (representing the Reid Library) consisting of Sir Walter M. Fletcher, K.B.E., F.R.S., Sir Charles J. Martin, C.M.G., F.R.S., and Sir Frederick G. Hopkins, P.R.S., representing the Medical Research Council; Sir Robert B. Greig, LL.D., Mr. F. L. McDougall, C.M.G., Sir Charles J. Howell Thomas, K.C.B., C.M.G., representing the

Imperial Agricultural Bureaux Council; Professor Hector M. Macdonald, F.R.S., Sir Ashley W. Mackintosh, K.C.V.O., LL.D., and Mr. J. F. Tocher, D.Sc., F.I.C., representing the Reid Library. The Editors will be Dr. J. B. Orr, Director of the Rowett Research Institute, Professor J. J. R. Macleod, of the University of Aberdeen, and Miss H. Chick, of the Lister Institute of Preventive Medicine, and they will be assisted by corresponding editors in various foreign countries. The abstracts will be made, as far as possible, by workers actively engaged in research.

The following list indicates the branches of the subject that will be reviewed: (i) Technique; (ii) Chemistry and properties of foodstuffs; (iii) Physiology of nutrition, including digestion, absorption, metabolism, and the chemistry of tissues and body fluids, and the relationship of ductless glands and hormones to nutrition; (iv) Human dietetics; (v) Feeding of farm animals; (vi) Diet and health, including deficiency diseases, and immunology, and population and morbidity statistics, in relation to nutrition; (vii) Therapeutic dietetics, human and animal; and (viii) Food economics. The journal will contain reviews by acknowledged authorities on the existing state of knowledge of particular subjects, those in the first issue being contributed by Sir Frederick Hopkins, Professor E. P. Cathcart, and Dr. J. B. Orr.

Nutrition Abstracts and Reviews will be of crown quarto size, 10 by 7¼ in., and Volume I will run to about 600 pages, including the index. For the present, the journal will be published quarterly in January, April, July, and October. The first issue will be in October, 1931, and will be a double number covering the literature from January to June, 1931. The subscription will be £1 1*s.* per volume, or 6*s.* 6*d.* per number (first [double] number, 13*s.*), payable in advance, post free to any part of the world. All communications should be addressed to the Secretary to the Committee of Management, *Nutrition Abstracts and Reviews*, Imperial Bureau of Animal Nutrition, Reid Library, Rowett Institute, Aberdeen.

* * * * * *

Forestry (Workers' Holdings)

IN the House of Commons, on July 8, Mr. Rosbotham asked the Parliamentary Secretary to the Board of Trade, as representing the Forestry Commissioners, the number of persons housed on the forest workers' holdings set up by the Commissioners, the average rent of the holdings, the average acreage, the number of head of livestock held by the tenants, and the approximate total

value of such stock; and the amount of the grants and loans by the Commissioners for the purchase of stock for these holdings.

The Parliamentary Secretary to the Board of Trade (Mr. W. R. Smith) in reply said: The information required, taken from the latest census of the forest workers' holdings established by the Forestry Commissioners, is set out in a table which, with the permission of the House, I will circulate in the Official Report.

Following is the table:—

Number of forest workers' holdings	881
Number of forest workers resident on the holdings	953
Total number of residents on the holdings	3,513
Average annual rent of house, outbuildings and land	£14 7*s.*
Average area	10 acres
Head of Live Stock:	
Horses	331
Cows	477
Cattle	244
Calves	245
Goats	321
Sheep	1,800
Pigs	1,316
Poultry	42,516
Other	177
Estimated value of the live stock	£31,338
Grants and loans by the Commissioners for the purchase of live stock	Nil

* * * * * *

Demonstration of Harvester-Threshers

THE Ministry has been able to arrange, by the kind permission of Colonel Douglas James Proby, for a demonstration of combine harvester-threshers to be held in the month of August at Berry Leas, Elton, Peterborough. At this demonstration, three machines will be operating, (*a*) a Caterpillar No. 38 (1930 model brought up-to-date), (*b*) an International (1930 model), and (*c*) a Massey-Harris (1928 model). Motor transport for the conveyance of grain from the field to the mill will be provided by the following firms: Messrs. Ford Motor Co. (special type tipping lorry); International Harvester Company of Great Britain (special six-speed farm lorry); and Latil Industrial Vehicles, Ltd. (special four-wheel drive and steering tractor

and trailer). A crop-dryer, specially designed for use with the combine harvester, will be working in the mill.

It is not possible at the moment to give the exact dates on which the demonstration will be held, but these will be announced later over the wireless.

Elton is situated nine miles south-west of Peterborough on the main road from Peterborough to Oundle and Northampton. It can be reached by rail by the following routes :—

(1) From London (King's Cross) to Peterborough (Northern Station).
(2) From London (Euston) via Northampton to Elton Station (L.M.S.).
(3) From Ely and Eastern England via Peterborough (East) to Elton (L.M.S.).
(4) From Rugby and Leicester via Market Harboro to Wansford Station.

The Ministry is also able to announce that the following gentlemen have kindly given permission for those interested to visit their farms when their harvester-threshers are working:—

Name and address	*Type of machine*
(1) Messrs. S. E. & J. F. Alley, Bluestone Farm, South Creake, Fakenham, Norfolk.	Massey-Harris (1931 model).
(2) J. J. Burt, Esq., Welbourn, Lincs.	International (smaller model with power take-off from Tractor).
(3) R. Dudley, Esq., Linkenholt Manor, Andover, Hants.	Caterpillar (1929 Hillside model).
(4) Flamsteadbury Estates, Ltd., Redbourn, near St. Albans, Herts.	International (1928 model).
(5) A. F. de Ledesma, Esq., Popham Court, Popham, Hants.	Massey-Harris.
(6) G. H. Nevile, Esq., Wellingore Hall, Wellingore, Lincoln.	Caterpillar (1930 model).

It is requested that those who avail themselves of the opportunity thus provided of seeing a combine harvester-thresher at work will be careful not to damage the standing corn and will avoid walking on corn lying in the swath.

The Ministry is also asked to announce that Messrs. Clayton & Shuttleworth, Gainsborough, will be demonstrating their harvester-thresher at the farms of :—

H. C. C. Tinsley, Esq.,
Holbeach St. Marks, and
Messrs. Major Brothers,
Abbott's Manor,
Holbeach, Lincs,

during the coming harvest. Anyone interested should communicate with Messrs. Clayton & Shuttleworth as to the dates on which they will be working.

* * * * * *

Guide to Current Official Statistics

THE Guide to Current Official Statistics, a new volume of which has been recently issued, will prove of great assistance to any one who desires to ascertain the extent and nature of the official statistics that may be available in regard to any particular phase of agricultural activity and also the title of the publications where such statistics can be found. The Guide consists of two main divisions, the first being a subject index arranged alphabetically with statements of the degree of detail in which the particular subject is treated, and the time and place to which the statistics relate, while the second part contains a list of the volumes issued by each Government Department. Directions are given for using the subject index to the fullest advantage, and by following these directions the inquirer should experience no difficulty in ascertaining exactly what official statistics are published in regard to any subject, and the names and prices of the publications concerned. The volume is not, of course, limited to agriculture, but covers the whole range of official statistics.

The Guide has been issued annually for some years past. Volume IX (319 pages), relating to 1930, is now available, and copies can be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller (price 1*s.* net. or 1*s.* 5*d.*, post free).

* * * * * *

Revision Course in Horticulture

A REVISION course in horticulture, designed for County Instructors in Horticulture and others, is being held at the University of Reading from September 14-19, 1931. A large proportion of the time will be occupied by lectures given by research workers and specialists in various branches of horticulture, so that the meeting affords exceptional opportunities for those attending to follow the lines

on which new knowledge is unfolding, and to discuss problems with specialists.

Each day will be devoted to a special theme: (1) a series of papers on the nutrition and manuring of fruit trees and the effect of manuring on the storage quality of fruit; (2) spraying problems; (3) strawberry cultivation and diseases; and (4) new work on fruit breeding and varieties.

Visits to places of horticultural interest in the neighbourhood are being arranged. Accommodation in the University halls of residence is available. The Annual Conference of the Horticultural Education Association will be held at the same time. Full details of the programme and particulars of application may be obtained from the Secretary, Agricultural Office, the University, Reading.

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Young Farmers' Clubs: International Dairy Cattle-Judging Competition

THE Young Farmers' Clubs' Tenth International Dairy Cattle-Judging Contest for the *Daily Mail* Gold Challenge Cup was held on July 8 at the Royal Show at Warwick, by courtesy of the Show Authorities. The competition, which is open to Young Farmers' Clubs in England and Wales and analogous organizations in other countries, attracted the champion judging teams from the U.S.A., Northern Ireland and England. This was the first appearance of a team from Northern Ireland in the competition; Canada also intended to send over a team, but at the last moment was unable to do so.

The cattle judged consisted of three rings of cows and three rings of heifers, four animals to a ring. The cows were of the Dairy Shorthorn, Ayrshire and Jersey breeds, and the heifers of the Friesian, Ayrshire and Jersey breeds.

The teams were :—

America	*Northern Ireland*	*England*
Chas. H. Clark	Robert Irwin.	John Arnison.
David J. Johnston	William Rea	Thirza Hobgen.
William Chilcoat.	William Mawhinney.	Thomas Busby.

A close and interesting contest, which attracted a large number of spectators throughout the day, resulted in a win for the U.S.A. over Northern Ireland by 1917 points (out of a possible 2160) to 1812 points, with England third, 1779 points.

The highest individual scores were :—

1st—William Chilcoat .. 653 points (maximum obtainable, 720)
2nd—Chas. H. Clark .. 650 ,,
3rd—Robt. Irwin .. 624 ,,
4th—William Rea .. 619 ,,

The Cup and *Daily Mail* Silver Medals were presented to the American team after the contest by the President of the Royal Show; *Daily Mail* bronze medals were awarded to the members of the Northern Ireland team; and certificates of merit of the Royal Agricultural Society were presented to the members of all three teams.

Mr. M. D. Bannister acted as Superintendent of the competition and Messrs. John Evens, Professor E. S. Savage (of Cornell University, U.S.A.) and Professor J. A. S. Watson were judges.

* * * * * *

Rats, and How to Exterminate Them

BY far the most injurious animals in Britain are the rats, and in spite of the energetic measures taken to reduce their numbers they remain a very serious menace, destroying enormous quantities of stored food, and spoiling much more than they destroy.

The Ministry's Miscellaneous Publication No. 51 (Rats, and How to Exterminate Them) has been out of print for some months. Many inquiries for the publication have been received, and to meet the demand the Ministry has re-issued the publication as No. 30* in its new series of Bulletins.

The Bulletin contains an account of the life history of the rat, and in addition there are practical notes on preventive measures, poisoning, gassing, trapping and deterrents, together with six pages of illustrations. Mice, field mice and voles are also dealt with adequately.

* * * * * *

Laboratory Tests for Bacillary White Diarrhœa

THE Ministry announces a further reduction from 3*d.* to 2*d.* of the fee charged at its Veterinary Laboratory for carrying out individual blood agglutination tests in the case of birds suspected of being carriers of bacillary white diarrhœa. This reduction came into effect on July 1, 1931.

This disease is one of the greatest handicaps which the poultry industry has to face at the present time, inasmuch as it makes the breeding of healthy chicks almost impossible on many farms. The agglutination test is the most practicable means of identifying the carrier hens which transmit the

* Bulletin No. 30, *Rats, and How to Exterminate Them.* Price 6*d.*, or 7*d.* with postage, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

disease through their eggs to the chicks. Seeing that this disease causes losses which are estimated to amount to several hundred thousands of pounds sterling per annum, it is obviously desirable that full advantage should be taken by poultry keepers of facilities that enable them to rid their flocks of the disease at comparatively small cost. The actual tests can be carried out at any reliable veterinary laboratory.

Applications for tests to be carried out at the Ministry's Veterinary Laboratory should be addressed to the Director, Veterinary Laboratory, New Haw, Weybridge, Surrey, who will promptly supply instructions and further particulars in reply to inquiries.

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The Imperial Fruit Show

To interest the general public in Empire fruits it is desirable that the Imperial Fruit Show should be held in all the large centres of population, and this is being done wherever possible. Exhibition buildings large enough to house the Show, however, can be found in only four cities in England—London, Birmingham, Leicester and Manchester—and thus the venue of the Show is much restricted. This year, the Show—the eleventh to be held—will be in the City Hall, a spacious building in the centre of Manchester, from October 30 to November 7, and should attract large crowds from Manchester and the surrounding towns.

The Show is being supported by the Empire Marketing Board and the Departments of Agriculture for Great Britain, Northern Ireland, the Dominions and Colonies. The Ministry will stage a large exhibit featuring the National Mark for fresh and canned fruits and for cider. Research exhibits will be sent by the Fruit Research Stations—the Horticultural Research Station at Long Ashton, Bristol, and the Horticultural Research Station, East Malling, Kent, whilst the Campden Research Station will deal with the progress of research in fruit and vegetable canning.

Classes for English apples—Cox's Orange Pippin, Worcester Pearmain, Allington Pippin, Bramley's Seedling, Newtown Wonder, Lane's Prince Albert—in trays, half boxes, boxes, half barrels and bushels, will be on a more extensive scale than heretofore. Classes for some of the promising newer kinds, Ellison's Orange, Laxton's Superb, Charles Ross, have also been arranged.

English apples will also feature in the larger classes open to the whole Empire for which two £50 cash prizes are offered for the best boxes of dessert and cooking apples. Apples from

Canada, Australia, New Zealand, Tasmania and South Africa also compete, and it is no easy task to select the prize winners.

Canned fruits will be a feature of the Exhibition, for a large and special section is to be devoted to exhibits to demonstrate the great development of this new industry and the high quality of its products. There will be competitive classes for canned fruits from factories, both large and small.

The Schedule of classes and prizes can be obtained from the Secretary, 5 Bloomsbury Square, London, W.C.1.

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Advisory Leaflets

SINCE the date of the list given in the December, 1930, number of this JOURNAL, p. 847, Advisory Leaflets have been issued, as given in the list below. The leaflets starred are re-issues, without substantial revision, of leaflets in the old series, and have therefore not been circulated to leaflet subscribers under the scheme set out in the issue of the JOURNAL mentioned.

No. * 8 Acorn Poisoning.
,, 16 Coccidiosis in Poultry.
,, *19 Fowl Cholera.
,, 20 "Blackhead" of Turkeys.
,, *21 Prevention of White Scour in Calves.
,, *22 Potash Fertilizers.
,, *23 Coral Spot.
,, 24 European Gooseberry Mildew.
,, 25 Vapourer Moth.
,, *26 Pear Midge.
,, 27 Blackcurrant Mite.
,, 28 Apple Blossom Weevil.
,, 29 Notes on Circumstances affecting Quality of Milk.
,, *30 The Gooseberry Sawfly.
,, 31 Sheep-Dipping.
,, 32 Navel Ill and Joint Ill in Newly-Born Animals.
,, 33 Preservation of Eggs.
,, 34 Plum Aphides.
,, 35 The Pear Leaf Blister Mite.
,, 36 The Mussel Scale.
,, *39 Fowl Typhoid.
,, 40 Small Ermine Moths.
,, 41 Feeding Stuffs for use with Cereals in Pig-Feeding.
,, 42 Codling Moth.
,, *43 The Packing of Eggs for Hatching and the Management of the Sitting Hen.
,, 45 Warble Fly.
,, 46 Docks and Sorrels.
,, 47 Stinging Nettles.
,, 48 Yellow Rattle.
,, 49 Destruction of Rats and Mice.
,, 53 Tomato Wilt or "Sleepy" Disease.
,, 54 The Bean Aphis.
,, 55 The Lung Worms of the Pig.
,, 56 The Large Round-Worm of Pigs.

Agricultural Meteorological Conference, 1930

THE report of the Agricultural Meteorological Conference, held at the Meteorological Office, London, S.W.7, on September 25 and 26, last year, has now been issued. It contains full accounts of the papers read at the conference, and a list of these, with the respective authors, is given below :—

Radiation from the Earth's Surface and Other Factors Controlling the Temperature of Objects Out-of-Doors at Night. (Mr. E. V. Newnham, Meteorological Office.)

Effect of Weather on Sugar-Beet. (Mr. I. T. Schapringer, Managing-Editor of *The British Sugar Beet Review.*)

The Effect of Climatic Conditions on Animal Production. (Mr. J. Hammond, School of Agriculture, Cambridge.)

Soils and Weather. (Dr. W. G. Ogg, North of Scotland College of Agriculture.)

Effect of Weather on the Action of Fertilizers. (Sir John Russell, Rothamsted Experimental Station.)

Effect of Temperature on Insect Life. (Dr. A. D. Imms, Rothamsted Experimental Station.)

Effects of Weather on Insect Pests. (Mr. A. Roebuck, Midland Agricultural College.)

Influence of Humidity on Collembola. (Dr. W. M. Davies, University College of North Wales.)

Effect of Meteorological Conditions on Apple Scab, with Special Reference to the Control of the Disease. (Mr. M. H. Moore, East Malling Research Station.)

The Need of Artificial Illumination for Poultry and Methods of Applying It. (Professor R. T. Parkhurst, National Institute of Poultry Husbandry.)

Copies of the Report (of which a strictly limited number is available) may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

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Rabbit Conference at Harper Adams College

PERSONS interested in the rabbit industry and associated enterprises are invited to attend a Conference at the National Institute of Poultry Husbandry, Harper Adams Agricultural College, Newport, Salop, on the 14th of this month (August). The speakers will include Dr. J. N. Pickard, Animal Breeding Research Station, Edinburgh; Capt. W. Brumwell, Pelt Manager, The Fur Board; Dr. J. B. McDougall; Mr. H. Gray, M.R.C.V.S., and Mr. W. King Wilson, National Institute of Poultry Husbandry. The Conference will be followed by an organized visit to the experimental rabbitry of the Institute. A display of pelts has been arranged with the co-operation of the Fur Board. Refreshments and a limited amount of accommodation will be available at the College.

THE HALF-BRED SHEEP

ARTHUR G. SPENCE,
Gifford, East Lothian.

THE term "Half-Bred" is applied to a breed of sheep that has long been in favour in Scotland and in the northern counties of England. In Scotland, on the higher ground among the heather, the Black-faced sheep is the predominant breed; on the grassy hills and upper pastures the Cheviot holds sway; but on the lower lands, where the grazing is too good for the Cheviot and not good enough for the Border Leicester or other breeds, the Half-Bred has proved the most satisfactory sheep to keep.

Being of larger size than the Cheviot, and having a heavier fleece (although not so good a quality of wool), the Half-Bred is a prolific bearer of lambs (which are of more value than Cheviot lambs in the market) and is the more suitable breed for the higher-rented lands.

There are two ways of producing the Half-Bred. (1) The most common and, in my opinion, the better way, is to cross the Border Leicester ram with the Cheviot ewe. With this, you get all the hardiness, good mutton qualities and fine, close skin of the Cheviot combined with the size, bone and quick-growing qualities of the Border Leicester. (2) The second way, followed on some farms, is to cross the Half-Bred ram with the Half-Bred ewe. The resulting product, although possibly bigger, does not, I consider, possess the hardiness of constitution, the fine mutton qualities, or so good a fleece as the first cross. I would certainly always stand for the Border Leicester-Cheviot cross.

There are, also, two types of the Half-Bred, depending on the source of the Cheviot, whether the Border breed or the North Country, bred in Caithness, etc. The original Border is the more handsome and more true to type, the North Country type being plainer, coarser-bred, and less hardy. An increasing number of these North Country Cheviots are being bought by the Border farmers, and this has not improved the appearance of the breed as a whole.

The points of a good Half-Bred are: a large, handsome head, well-covered with white hair, with no trace of blueness or dun spots on it; ears well set on, also well covered with fine, white hair, and neither too long nor too short; broad between the eyes; good, strong, wide, black muzzle; large bright eyes with no appearance of pinkiness about them. The body should be long, with neck well set on; well-sprung

ribs ; good mutton carrier ; level along the back and square across the quarters ; and carried on good, flat, strong-boned legs covered with white hair that has no brown patches or spots. The fleece, although not quite so close as that of the Cheviot, should be close and thick with a very fine staple, and should cover the body well ; the breast and belly should be well covered. There should be no wool on the head or on the legs below the hocks.

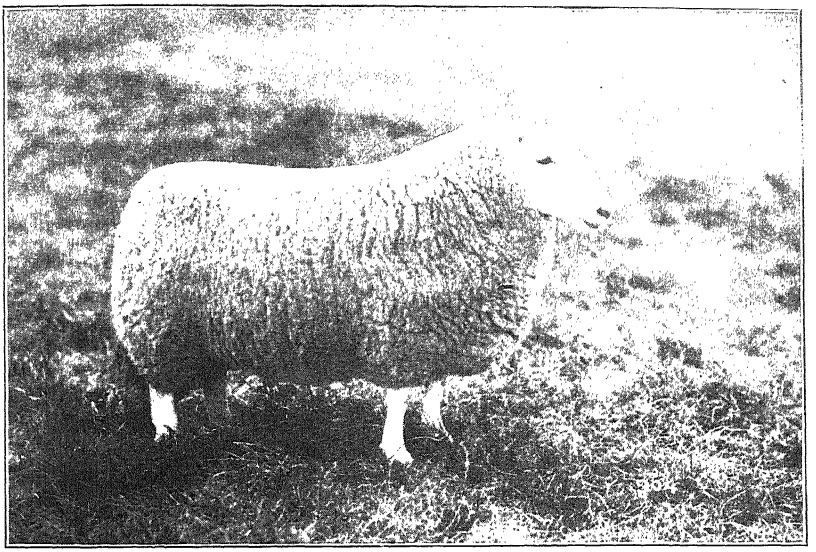
The typical Half-Bred is active, has a good carriage, walks well and, with its large white head, makes a handsome sheep of which anyone may be proud. Half-Breds can be carried on any good average ground. They breed well (four twins to a single is not unknown), are good mothers, and both they and their offspring are of hardy constitution.

On many Border Country farms, having a range of upland as well as lower ground, it is customary to keep a Cheviot flock on the upper ground and a Half-Bred flock on the lower and more fertile land. The usual practice is to mate the two younger ages of Cheviot ewes with a Cheviot ram, and the two older ages of Cheviot ewes with a Border Leicester ram. Cheviot gimmers (ewes having a first lamb) are better able to carry and nurse a single Cheviot lamb than a pair of Half-Bred lambs.

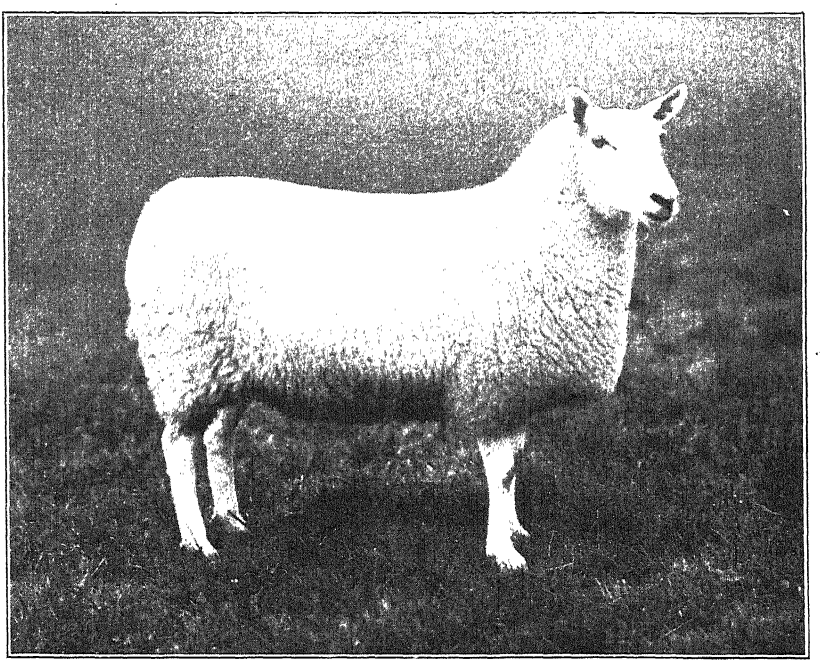
Thus the method described keeps up both the Cheviot and the Half-Bred flocks. At the same time, any one-crop Cheviot ewe that does not conform too well to the Cheviot type, may, if not drafted out altogether, be put to the Border Leicester ram ; while any of the older ewes, known to be good breeders of Cheviot lambs, may be mated again with the Cheviot ram.

Great care must be exercised in the selection of rams, whether Cheviot or Border Leicester. Any general weak point in the flock should be noted, and the rams selected should be specially good on that point. For example, if the members of the flock are a bit wild and open in the fleece, the ram selected should have a particularly close fleece. If the formation of the head is a weak point in the flock, the ram to select is one with a strong, white head, strong jaw and wide muzzle.

By care in the selection of rams and in the drafting of ewes in the autumn, and by the elimination of ewes not quite true to type, and any that show weakness of constitution, or are bad nurses, etc., the flocks of Cheviots and Half-Breds may be rapidly improved until, in a few years, drafting out for faults will be reduced to a minimum.



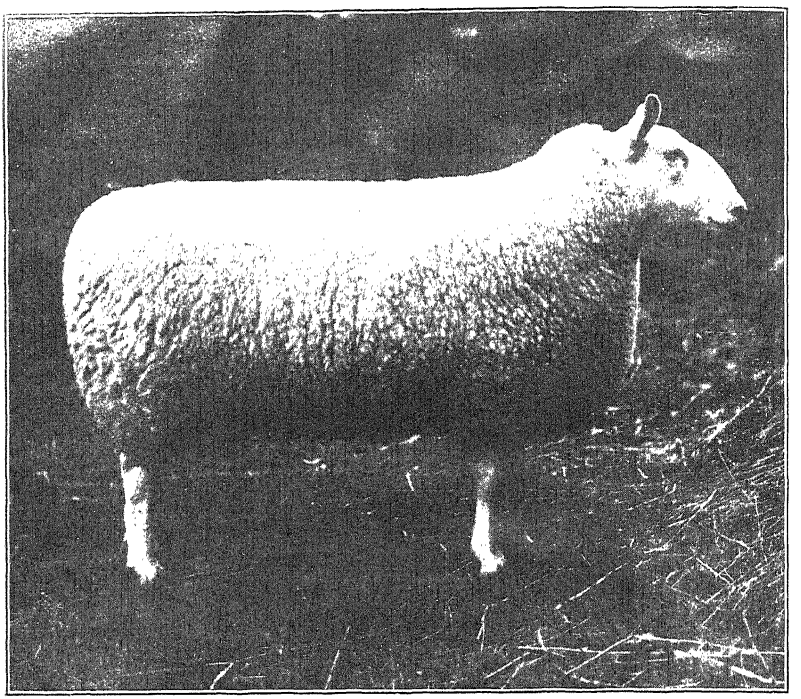
Border Cheviot ewe.



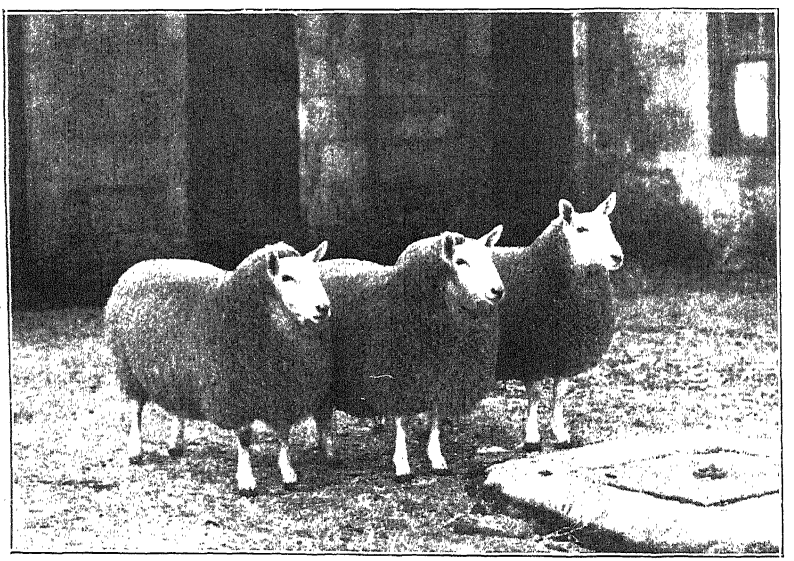
Photos: A. Brown & Co.

Half-Bred ewe (Border Leicester ram x Cheviot ewe).

To face page 470.



Half-Bred gimmer (Border Leicester ram x Cheviot ewe).



Photos: A. Brown & Co

North Country (Sutherland) Cheviot ewes.

Although it is not necessary to go to the high prices paid by breeders of pedigree stock for Cheviot or Border Leicester rams, a good price for the rams should not be grudged, as they have a very strong influence on the future of the flocks.

The management of the Cheviot flock is very similar to that of the Half-Bred flock (described later), but the Cheviots are not such heavy feeders. The Cheviots will graze and prosper on the poorer land and on old grass; they do not require extra feeding or to be put on turnips so early in the winter as the Half-Breds, and, in time of snow, will do well with a supply of good hay laid down to them. The Cheviot rams, also, are put out to the ewes a week or two later than in the Half-Bred flocks.

On the lower farms, where land is not available or suitable for a Cheviot flock, the Half-Bred flock may be kept up by putting the gimmers to a Half-Bred ram, or the farmer may, at the autumn sales, buy Half-Bred ewe lambs or gimmers that have been bred from a Border Leicester ram and a Cheviot ewe on the higher farms. The latter is the commoner practice, but, if followed, the best stock only should be selected; a lot of the poorer stock offered for sale are just another man's cast-offs.

Breeders of Half-Bred rams, if they have not a Cheviot flock of their own, buy in draft Cheviot ewes from a good flock, put them to a Border Leicester ram and pick out the best of the produce for rams and ewe lambs respectively.

Management.—On general lines, the management of a Half-Bred flock requires continual care and attention as with any other breed of sheep. Taking September as the beginning of the year, the ewes are brought in from the higher, poorer ground on to fresh, clean and better grass. If the pasture is good and a run on the stubbles and seeds available, no further flushing is required; but, if the grass is bare, a light feed of "ewe food" and oats, or oats and dried grains, may be given.

On the higher farms, rams are not put out with the ewes until mid-October; but in early districts, much sooner. About 50-60 ewes go to a ram, and care should be taken in selecting the ewes for each ram. As tupping goes on, the ewes are taken out each week, marked and run together in some of the other grass fields, with a spare ram amongst them to catch any that have missed.

After mating is finished, the ewes may be left on the grass fields, being changed to different fields as the grass fails;

and this treatment can be carried on as long as there is sufficient feed. As soon as the grass fails, which will depend on the season, the ewes will require turnips laid down to them, beginning at any time from the end of November to the middle of December.

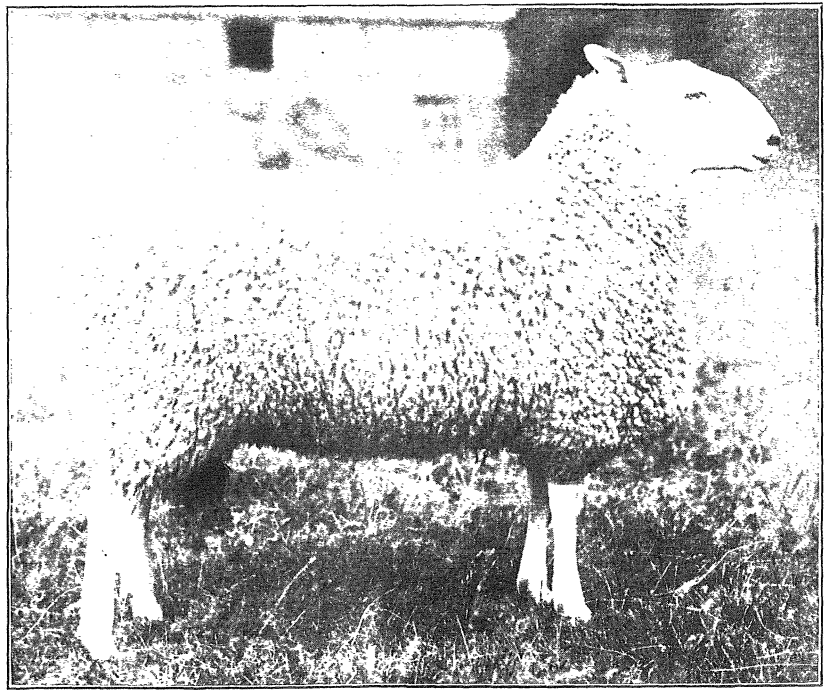
By degrees, the ewes are folded on to the turnips for two or three hours daily, and are run off on to a grass field, or, if grass is not available, on to a bare break where they are given hay, which must be good and not mouldy. This run off is most essential, for it is one of the secrets of success that the ewe flock should get the chance of plenty of exercise. Half-Bred ewes should not be allowed too long on turnips, for they are greedy feeders, and experience shows that too many turnips may aggravate lambing troubles. The flock must, of course, be brought to the lambing field in good heart, but it is a great mistake to have the ewes fat. When lambing time arrives, ewes are taken to the lambing field, in which shelters have been erected, and are taken into the shed at night. Turnips are laid down to them in the field, and they should get a light feed of oats, bran, lentils or mill seeds.* This feed should not be overdone before the ewe has lambed, or it may cause stomach troubles. Careful attention must be given during lambing, but if the flock is in good heart, and has been properly wintered, very little assistance should be required in lambing the ewes.

As the ewes lamb they are drafted out into the grass fields, those with twins being put on the young grass, preference being given to gimmers with twins ; the remaining ewes with twins get the best of the second year's grass, with the ewes and single lambs on the remainder of the second year's grass. Lambs do not do well on old grass. Box feeding is continued until May 28, when it is stopped except for those lambs that are going for sale. The lambs are allowed to run with their mothers until mid-July, when they are weaned, the ewes being transferred to the upper, barer land to run the milk off them. There they are allowed to remain, but the draft ewes are taken out after a short time and given better treatment to prepare them for sale.

Three crops of lambs are taken from the ewes, which are then sold. Their mouths and udders are carefully examined, and any ewes found faulty in these points are taken out of the draft. Those having udders and mouths without fault are

* The leavings from the gristings of oatmeal.

To face page 472.



A Border Leicester ram.

sold as guaranteed-correct, three-crop ewes, and they are bought by farmers in the lower districts, who put them with the ram early for the fat lamb trade, selling the lambs and ewes in the early spring and summer. The bad-mouthed ewes are either sold as unwarranted or are put in to feed.

The ewe lambs, whether bred on the farm or bought in, are kept running on the grass until the early autumn, when they are given a little box-feeding, if necessary, and turnips are laid down to them. By degrees, these sheep are folded on to the turnips and are given a light feed and hay. They remain folded on turnips until about the middle of January, when they should be given cut turnips, as they are beginning to lose their teeth. In March, they may be taken off the turnip field and put on grass, with cut turnips given to them on the grass. In April, they are turned out on the uplands, being given a little box-feeding as long as it is required. Here they remain all the summer and are drafted into the flock as gimmers in the autumn.

Care and attention are the main factors in the management of sheep, which must always have good, clean feed, be it grass or turnips. Dirty fields and dirty feed-boxes cause many troubles. Dirty sheep are a worse trouble, and a good look out must be kept during the summer for maggots on both ewes and lambs. If sheep are really to thrive and to be comfortable and happy, dipping twice a year is essential. This kills the keds and ticks, etc., and is also a preventive of fly-blow and sheep scab. Further, in so far as it helps to keep the sheep thriving, it improves the fleece. No good stockman grudges either the time or the expense involved in dipping. An arsenical dip should be used, with sulphur added in the summer.

The great factor for success, however, is to have a good shepherd with a good dog, and in the Border Country we still have shepherds to whom the sheep in their charge are of more importance than their own personal ease and comfort, and who never think a day too long or too arduous if the sheep require attention. The great reputation for sheep breeding which the Border Country enjoys is largely due to the fine men that have devoted their lives to shepherding.

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THE USE OF PEAT IN HORTICULTURE

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THE extensive deposits of peat in Northern Europe and North America have often been considered from the aspect of their potentiality as a source of many valuable products. Peat consists of the remains of bog or marsh plants accumulated under moist conditions, in the absence of oxygen; decomposition has been arrested and the residue is in a partially carbonized condition.

When straw manure was abundant and easily obtained, the possible value of peat was little considered by horticulturists. With the growing scarcity of straw manure and the realization of the importance of humus in maintaining a good mechanical condition of the soil, interest in peat is increasing. It has been extensively used in Germany for some time, perhaps owing to the readily available supplies in that country, and it is gaining much notice in the United States of America.

The different kinds of peat that are used in horticulture will be discussed later, and the general term "disintegrated peat" is used to cover the several forms. It is employed both on account of its physical properties and in connexion with fertilization.

The Use of Fresh Peat.—1. *Propagation.*—Disintegrated peat is, for many plants, a very favourable medium for root formation. It is used at Kew for rooting various cuttings, being found to be superior to cocoanut fibre for this purpose. Strawberry runners also root readily in peat. A. E. Hitchcock (1)* in America made an experimental study of the effect of peat moss and sand on the rooting-response of cuttings. He found that cuttings could be classified according to the readiness with which they rooted in peat moss or sand, but that the large majority of cuttings from all groups rooted readily and more rapidly in a peat and sand mixture. He concluded, therefore, that such a mixture was the best general medium for propagating purposes, and that the most essential conditions for rooting, *i.e.*, good aeration and aseptic conditions, were obtained. He also studied the question of the acidity of the medium and found it was not of first importance. Alex Laurie, at the Michigan Experimental Station (2), has found that the majority of the hard- and soft-wood cuttings

* References will be found on page 481.

that he tried rooted best in a mixture of sphagnum, peat and sand.

The use of disintegrated peat in seed-beds has also yielded good results, owing to its texture and aseptic nature.

2. *Potting.*—Admixture of peat with potting soils has frequently been found to promote a good texture, and has also proved particularly useful for certain plants, including Gloxinias, Gesnera and Streptocarpus. Peat is the principal constituent of most bulb composts. All ericaceous plants and liliums grow readily in peat or a peat and sand mixture, and it is commonly used for growing azaleas and rhododendrons, although recent opinion suggests that it is not essential for these plants, which are calcifuges and will grow in many lime-deficient soils.

3. *Admixture of Peat with Soils.*—Successful results have been obtained in Germany and America by adding peat to both heavy and exceptionally light soils with the object of improving the soil texture. Few trials have been made in this country, but Mr. Engelmann reports in favour of adding peat to some heavy Essex clay.

The effect of mixing disintegrated peat with both potting and garden soils is primarily physical in nature. The part played by humus in forming a good tilth and that played by peat are analogous, if not identical. Herein lies the reason why further experiments are desirable, taking into account the subtle distinction between peat and humus. Some prejudice against the use of peat exists on account of detrimental effects that have been recorded. For example, Dr. Bewley, at Cheshunt, found (1) (in early experiments) that a depression in the yield of tomatoes and cucumbers resulted (2) (in the first year) from the admixture of (3) ordinary English peat with the soil.* Several reasons have been put forward from time to time to account for ill effects following the use of peat.

(i) ACIDITY.—All peats have an acid reaction and a high lime requirement, and it has been suggested that this acidity has definitely deleterious effects on plant growth. This has not been definitely established, however, and the actual range of pH concentration tolerated by plants shows that the great majority could grow in a medium more acid than the soil would be after the addition of disintegrated peat.

(ii) TOXICITY.—Dachnowsky (3), in America, found by experimentation that substances harmful to plant growth exist in bog soils and peat, and are liberated by the growth of plants in these

*This season, however, a high-grade sphagnum peat was added to steamed soil at the rate of 30 tons to the acre. The subsequent tomato crop shows very definite promise.

soils. As he showed that these substances may be removed by certain absorbing materials, as, for instance, lime or carbon, and that their toxicity is reduced in well-aerated soils, one would expect that the conditions prevailing in most soils would eliminate such harmful emanations from peat. The most "toxic" peats appear to be those containing the highest percentages of fats, such as some of the cotton-grass peats from the Pennines, other types being much less "toxic" and more suitable for horticulturists. However, this appears to be another aspect not fully explored.

(iii) INSUFFICIENT DECOMPOSITION OF PEAT.—Since the decomposition of the plant remains was arrested in the formation of peat, which is in a more or less aseptic state, it is not very readily decomposed by bacteria in the soil. Moreover, the plant constituents most easily broken down have already disappeared, leaving the more refractory components, such as those of a fatty nature. This "inert" quality emphasizes the physical, rather than the fertilizing, effect of peat on the condition of the soil. Peat is, however, slowly broken down, and, as experiments at Rothamsted have shown, unless there is a plentiful supply of nitrates and other plant food in the soil, the cellulose-decomposing bacteria will utilize these foods to build up their own bodies. The result would be a shortage of nitrates, etc., available for the plant, which would account for the apparently depressing effect of peat. Hence the use of peat in conjunction with fertilizers is recommended; this yielded good results in Germany and in Laurie's experiments (*loc. cit.*). Hence the value of conserving the peat, together with fertilizers, in a compost heap to advance decomposition, and of certain proprietary peat products more broken down and approaching leaf mould in general character.

4. *Other Uses.*—The peculiar texture of disintegrated peat, its aseptic condition, and the manner in which it maintains a uniform humidity for a considerable time, renders it useful for numerous minor purposes. It is employed at Kew Gardens for plunging various pot plants. It has been recommended in appropriate states of dryness for storing fruit, dahlia tubers, etc., and for sprouting potatoes, but does not appear to be widely used for these purposes, at any rate in this country. It is, however, a convenient medium for packing plants for export, and is extensively used in the Canary Islands and Madeira—dry, for packing tomatoes, and damp for potatoes.

5. *Practical Suggestions.*—Before using disintegrated peat for most of the purposes mentioned above, it is important that the peat be suitably moist. When obtained, the peat should be made into a pile in the open, watered, and turned over at intervals until thoroughly moist, but not sodden. Different samples vary in the amount of water required, and the time taken to absorb it.

For propagating, peat alone may be used in the trays, as at Kew, where the rate and extent of rooting of many cuttings, notably begonias, is found to be considerably enhanced. If

preferred, sand may be mixed with the peat ; different plants will be found to root best in different mixtures. The peat must be damped at intervals and its open texture preserved, but it will be found to dry out very slowly.

For strawberry runners, one-third of peat may be added to the top 4 in. of soil. The young plants can then be lifted later with their roots holding a good ball of soil.

Similar variations will hold for potting soils. A fair average would be two parts of loam to one of well-decomposed manure and one of damp, disintegrated peat. If artificial manures are substituted for dung, more peat should be added. Sand may also usefully be added.

Disintegrated peat is sometimes used by itself for seed beds, but more usually loam is added. Both peat and loam should be sieved and damped before the seed is sown ; the actual method of sowing will depend on the kind of seed in use. Mr. Engelmann uses the same quantity as for strawberry runners when raising seedlings of pansies, violas, polyanthus, asters, stocks, etc. He also recommends incorporating a 2 in. layer of peat with the top-spit of soil for indoor roses, and a proportion of 1 part of peat to 5 of soil for asparagus, fern and cyclamen soils.

When adding peat to the soil on a larger scale, the quantity used is likely to be governed by costs. Up to 5 tons per acre may be regarded as beneficial for improving soil texture ; dung or artificials should be used in conjunction with it, and the importance of thorough mixing should always be borne in mind.

Peat in Connexion with Manuring.—1. *Peat Mulches.*—Laurie (*loc. cit.*) found that for many greenhouse plants, including chrysanthemums, greater beneficial results accrued from adding peat as a mulch, rather than from incorporating it with the soil. Sedge peat was more effective in this connexion than sphagnum peat, unless this was used in conjunction with nitrogenous fertilizers. A subsequent dressing of superphosphate proved beneficial. He attributed these results to a fertilizing action of the peat.

As a mulch, out of doors, he found it useful for discouraging weeds and counteracting the effects of thawing or freezing, and similar results have apparently been obtained in Germany. Little has been done in this direction in this country, where it is often considered that the impervious condition of disintegrated peat, when dry, renders it unsuitable as a mulch out of doors.

2. *"Inoculation" of Peat.*—Attempts were made by Bottomley (*see* G. D. Know (4)) some years ago to inoculate peat with nitrogen-fixing bacteria, and he claimed a rich fertilizing value for the "humogen" thus prepared. A repetition of his experiments by Chittenden and Russell (5) indicated that the value of humogen as a fertilizer was practically negligible. His theory of vitamin-like substances called "auximones" in peat, which stimulated plant growth, has not been established.

More recently, R. A. Altson (6) has reviewed the situation, and calls attention to German and Russian experiments that aimed at nitrogen-fixation in peat soils. In brief, these experiments suggested that peat may be converted into a valuable plant food by bacterial action. The method involved inoculation of the peat soil with the nitrogen-fixing bacterium *Azotobacter*, and the formation of a suitable environment for its action by the addition of minerals and cellulose-decomposing bacteria to provide a source of carbon.

3. *Peat-Moss Litter Manure.*—Peat-moss litter is extensively used for stables, poultry runs and batteries, and, since it absorbs as much as 10 times its weight of urine, a very rich manure is formed. It is frequently employed in the fresh condition by market gardeners in Sweden. It is greatly superior to wood-chip manure, but is often considered inferior to straw manure perhaps owing to its deficiency in potash or to slow decomposition.

No exhaustive experiments comparing its action with that of straw manure have been carried out. A few tests were performed at Cockle Park in 1905 (7) when better crops of swedes were obtained on land manured with peat-moss litter manure than on land dressed with straw manure, and better growth of certain seedlings was observed. It was inferred that peat manure was especially beneficial for quick-growing crops. The manure is popular for vegetable crops, especially roots grown in open fields. Favourable results have recently been reported from Russia, where an increase of 8 per cent. of yield in cereals and 25 per cent. in roots resulted from applications of peat moss manure.

4. *Use of Peat in Composts.*—Although deleterious effects have sometimes resulted from the use of fresh peat-moss litter manure, they are not recorded from the use of peat manure that has been stored for a period.

(i) PEAT AND DUNG.—During the war Professor Weiss (8) drew attention to an experiment made in 1815, of mixing peat and

dung in heaps, which formed a rich manure. A similar practice is now common in America.

(ii) PEAT-MOSS LITTER MANURE COMPOSTS.—The best way in which to utilize peat-moss litter is undoubtedly to form compost heaps, as described by Dachnowsky (9) and Dawson (10). Piles are made in the open, in an airy, shady spot, consisting of alternate layers of peat-moss litter, manure and soil, useful additions being mineral fertilizers, such as phosphates and potash. Dachnowsky reports that a rich black humus is formed in six months, and also mentions other types of peat composts, such as those formed with sewage (especially in Sweden), fish scraps and molasses.

Dawson has explored the subject of composts in connexion with their value as dressings for golf-greens, and found them to be very beneficial, for numerous reasons. Peat-moss litter manure can be used in the compost heaps with excellent results. Certain proprietary brands of granulated peat may be applied in the fresh state to golf greens and lawns in the same way as these composts. They are applied as top-dressings, raked or brushed into the turf.

Composts incorporating peat and compost-like "peat moulds" may be widely used in less specialized horticultural practice as a substitute for leaf mould, and have been successfully employed as a dressing for some types of grass land.

Sources and Supplies of Peat for Horticultural Purposes.—Extensive deposits of peat are found in the Northern Hemisphere, particularly in Great Britain and Ireland, Germany, Holland, Scandinavia, Russia and North America. In Germany peat moors are classified as "hochmoor" and "flachmoor." In the former, peat has been deposited in upland bogs, formed largely of sphagnum and moor plants, and it contains little mineral matter. Flachmoor peat was formed under low-lying marsh or estuarine conditions, is composed of sedges and similar plants, and is less acid and contains more sediment of a mineral nature than hochmoor peat. Dachnowsky (11) and others have studied the peats of North America and described them according to the vegetation from which they were formed. Roughly, the reed, sedge and brown moss peats of the United States correspond to the German flachmoor; the bog and heath peats to the German hochmoor. As was previously mentioned, Laurie (*loc. cit.*) found that different values and uses could be distinguished for sphagnum and sedge peats, and although either type may be used for the majority of purposes, it is important to realize their distinction. In general, sphagnum peat is the more granular and retains more of its original structure, is looser in texture and frequently more acid than sedge peat, which, unless

specially disintegrated, is the more fibrous, less granular and in a more advanced state of decomposition. The sedge peat contains more available nitrogen and is less acid, owing to the presence of mineral sediments. At the present time the most important types of peat of commercial value in Great Britain are consolidated peat "bricks" or turves for fuel and peat-moss litter. The litter is derived mainly from the upper layers of a deposit, and is dried, torn up and passed over rotary screens, so that a "litter" of varying texture or granulation is produced. Certain deposits show more stratification, and these are dealt with suitably layer by layer.

Germany and Holland utilize large quantities of peat, and an important export trade has been developed, especially with disintegrated peat which is chiefly of the sphagnum type, and of this Germany contains the richest deposits in the world. Large quantities are sent annually to the United States of America and to Great Britain.

Efforts are being made in the United States to utilize home supplies and also in Russia, where over 70 million acres of valuable peat are estimated to exist, 52 per cent. of it being of the hochmoor type.

In Great Britain, the peat deposits have been estimated at 3½ million acres, much of which is now being exploited by commercial firms, and several excellent products are available for horticulturists.

Peat of the bog or hochmoor type occurs in Scotland, Ireland, Wales, Yorkshire and the Pennines. Smaller deposits are found in the New Forest, Dorset, Devon and Cornwall. From these are derived both fuel peat and peat-moss litter. This peat is formed of sphagnum moss, *Calluna* (heath) and other moor plants. Some of the best peat of this description for horticultural purposes is obtained in the New Forest.

Extensive peat deposits are also found in Somerset, and these yield valuable disintegrated peats suitable for horticultural use. Here the peat is more of the sedge type, being formed in lake-basins. Water draining from limestone hills to the east, chiefly the Mendips, has resulted in the peat being non-acid until raised above the ground level. This peat is composed chiefly of *Calluna* (heath), *Eriophorum* (cotton grass) and *Molinia* (moor grass).

Fen peat occurs in the Fenlands of the eastern counties; it was formed under estuarine conditions, contains more sediment than other peats, and is alkaline in reaction. The most important constituents are the sedge-like *Cladium*

Mariscus and *Molinia*. These peats appear to have been little exploited, although reclaimed peat land in these counties yields rich agricultural land, analogous in many ways to that in North Lancashire, but the question of reclamation does not come within the scope of this survey.

The aim of the writer has been to indicate the main lines of experimentation with peat by horticulturists, and to draw attention to its possibilities and value. She desires to express her cordial thanks to all those who have so readily given information and assistance.

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B.B.C. TALKS ON PIG-KEEPING.—III*

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Now I come to what is perhaps the most critical question for the pig-farmer—shall he lay out his business to produce porkers or bacon-pigs? Of course, porkers generally make the better price: from 1*s.* to 4*s.* a score extra, according to the market and the time of year. But that extra price, alone, may not make the porker the more profitable, nor prevent an additional profit from carrying on the pig to the bacon-weight. The reason is that the prime cost of the sucker has to be paid for by the profit made later in the conversion of food into meat, and, with the porker, you have a much smaller selling weight over which to spread the first cost. Again, labour and overheads generally come in practice to a fixed charge upon the number of pigs sold, either as porkers or baconers. If you sell porkers at about five months old, then, in order to keep your fattening sties full, you must keep more sows; and, except with a very big and careful organization, one man does not actually feed many more porkers than baconers. In the case I have been quoting from, the sucker costs on the average 31*s.* 6*d.*, and the labour and overheads for the after-feeding cost 15*s.* 8*d.*, a total of 47*s.* 2*d.* per pig sold. Now this charge amounts to about 9*s.* a score on the porkers, which average about 5 score and a quarter, but it only comes to about 6*s.* a score on the baconers, which average nearly 8 score at sale. This is the reason why it is often more profitable to carry on pigs to bacon-weight even when there is a tempting difference of price in favour of the porkers.

The pig-keeper should be prepared to take either market from time to time as prices rule, but he must be able to calculate in any week whether it will pay him better to send to market whatever may be ready as porkers, or to keep them on. That calculation depends on three factors—the difference in the price of the porkers and baconers, the actual or rather prospective price of baconers, and the price of food. This is how I make the calculation, using the average weights that have ruled on the farm I have been speaking of. I multiply the average weight of a porker by the extra price porkers are making: this gives me what I shall lose if the porker is kept on and sold as a baconer. To calculate the

* This Broadcast talk was given on April 1 last. The first of these talks was published in the issue of this JOURNAL for June, 1931, p.254, the second in the issue for July, 1931, p. 355.

corresponding gain I reckon that 400 lb. of food will have to be fed to give an extra 2½ score of baconer. If this 2½ score is worth more than the 400 lb. of food *and* the loss on the porker, then the baconer is the more paying proposition. You think it sounds a bit complicated, but it is really a very simple calculation. I will give an example. The Ministry's market report for last week [March 27, 1931] makes out that porkers average about 3*s*. a score more than baconers, which are at about 14*s*. a score. The price of the feeding stuffs making up the pigs' ration works out to about 5*s*. 6*d*. per cwt. As the porker weighs about 5¼ score, the loss on feeding it further will be 5¼ × 3*s*. or, say, 16*s*. The 400 lb. of food will cost 20*s*., as near as will serve, and the 2½ score of meat put on will be worth 35s. So, on this showing, 1*s*. a head would be lost by carrying on the porkers to baconers. Of course, a few shillings might be put on to the credit side for the manure-value of the 400 lb. of food, but it is poor farming when the profit has to be found in the valuation.

However, 3*s*. a score is a bigger difference than usual between the price of porkers and baconers, and very often, when a calculation of this kind is made, the pig-keeper will be surprised to find that bacon pigs promise the greater profit.

This calculation, however, provides no information as to whether the pig-keeping as a whole has been profitable. It merely shows the comparison between porkers and baconers at the prices then ruling; but there come periods in the pig-keeper's experience when neither porkers nor baconers can be made to pay, because the value of the finished pig is not equal to the cost of the food required to produce it. This, for example, is evident when we are considering whether or not to carry on the porker. There can be no possible profit in doing so unless the price of bacon, per score, is half as much again as the price of food per cwt. If bacon pigs are 12*s*. a score and food is 8*s*. per cwt., then the extra weight put on will only just pay for the extra food consumed, and there is nothing to set off against the loss incurred by selling the porker at bacon-pig price per score.

From the average prices provided by the records of the farm I am talking about, we can make a simple calculation that will show the prospective profit or loss on pig-feeding according to the prices ruling at the time.

Our starting point is the sucker, the cost of which has averaged 31*s*. 6*d*. Of course, as I have explained, this figure

could have been improved upon had the sows given steadier litters. At times, also, in the period during which this record was taken, food has been comparatively dear—over 10*s.* per cwt. At present prices of food, and with selected sows averaging near eight pigs per litter, the cost of the sucker would come down to 20*s.* To the sucker cost must be added 15*s.* 8*d.*, the average cost of labour and overheads per pig sold, a figure which will not vary appreciably whether porkers or baconers are turned out. But taking the average figures on the farm I am dealing with, the prime charge was 47*s.* 2*d.* Dividing by the average weights at sale, this will be equivalent to a cost of 9*s.* per score on the sucker or 6*s.* a score on the baconer, as already indicated. Now we have to add the cost of the food consumed in the fattening stage, either from sucker or porker or from sucker to baconer. In the first case, 5¼ cwt. of food was the average consumption, practically 1 cwt. of food for every score of porker sold. The calculation then becomes very simple—the cost per score of the porker will be 9*s.* plus the cost of food, say 5*s.* 6*d.* at the present time, or 14*s.* 6*d.* in all. The baconer eats more food per score of finished pig; in the records I am quoting, the average consumption was 8·92 cwt. for an average dead weight of 7·87 score, or approximately 1⅛ cwt. of food per score sold. This, then, makes the cost of the baconer per score 6*s.* + 1⅛ cwt. of food, which, at present prices, would be about 6*s.*, 12*s.* in all.

Now I am not going to pretend that the figures I have been giving you are unassailable. Indeed, I have given you reasons to suppose that the cost of the sucker is open to reduction, apart from the reduction that would now come with cheaper food. But the ~~labour costs, the overheads and~~ the figures I have given you for the ratio of conversion of food into meat, do represent good actual practice over a period of years. Working on a large scale, with careful organization, the charge for labour and overheads might be reduced, but it is not a large item, about 3*s.* per score in the sucker, and 2*s.* per score for the baconer. On the other hand, I do not think the rate of food consumption is susceptible of much improvement.

At any rate, even if you disagree with my figures, it is up to you to keep accounts against your pigs that will show you how much you can better my costs. I repeat my method of calculation—arrive at a figure for sucker, labour and overheads. That will be somewhere between 6*s.* and 9*s.* a

score for porkers, and 4*s*. to 6*s*. a score for baconers. The cost of porkers per score will be this figure plus the cost of the food per cwt.; the cost of the baconer will be the alternative figure plus $1\frac{1}{8}$ cwt. of food.

So far, I have been considering only the cost of production of an individual lot of pigs; the much more important question is whether farmers will be well advised to make a strong feature of pig-keeping, whether it will pay year in and year out. One has to recognize that few agricultural products show greater market fluctuations than pigs do. "Pigs are either muck or money" is a well-known saying, and too many farmers make the worst of both worlds by beginning pig-keeping when prices are high and then throwing it up in disgust because the market has broken just when they have pigs to sell. Pig-keeping can only pay if followed up steadily over a term of years, so that the farmer can have time to select his sows for good litters and to pick and train his men so as to ensure good management. None the less, it is just the element of fluctuation of price, the fact that for periods of months together the price of bacon pigs remains below the necessary cost of production, however good the management, that has hindered the development of pig-keeping in this country.

As I told you before, we had over two million pigs in the country 60 years ago and we have not three million to-day. Meantime, the consumption of bacon and other pig products has risen by leaps and bounds; we import 40 million pounds' worth every year, and this has been supplied by countries like Denmark, where the number of pigs has risen from half a million to five million. This stagnation of our business, while we possess the best market in the world, has been, in some respects, due to the policy adopted by the bacon-curers of this country, who buy their pigs from hand-to-mouth, and have in consequence thrown all the risks of the fluctuating price upon the producer. In order to build up a stable business of any magnitude, the manufacturer usually takes steps to assure himself of the supply of his raw materials, but the bacon-curers, on the contrary, have been averse from making forward contracts for the delivery of pigs on terms that would safeguard the farmer. It has been the experience of the pig producer that if, on the same day, he sent one lot of pigs into his local market and the other lot direct to the bacon factory, he might get the better price in the market even though both lots eventually arrived at the same factory.

One result of this policy has been that the bacon-curers have never been able to obtain in quantity the type of pig they want. They complain that only one pig in five they buy is suitable for making first-class bacon. Why not specify what they want and make such a contract as will secure that they get it? It is only within the last few years that the bacon-curers have put out a public statement to farmers of what a bacon pig should be, and, even now, I am not aware that they will pay a better price for quality—for pigs bred and fed according to their conditions. Farmers have been reproached for the irregular supply and the unsuitability of their pigs for bacon curing as compared with the supplies that come forward to the Danish factories, but they have been left without the one guidance that matters—better price for the right article. Again, the bacon-curers declare that they cannot obtain enough pigs, and that their factories are only working up to 55 per cent. of their capacity. Why not, then, take steps to nurse the production and develop sufficient supplies to keep the factories occupied on an economic scale of working? This alone would enable the factories to offer farmers a better average of prices.

I am aware that farmers at large have been equally undependable as regards keeping up the supply of pigs to the bacon factory. If pig-rearing is to be a bit of a gamble, the farmer wants to be free to change over to the porker market when there is more money to be made there. Reading the current report of the St. Edmundsbury Bacon Factory —a farmers' co-operative venture—I see that, whereas in 1929 it received nearly 30,000 pigs, in 1930 the supplies dropped to less than 20,000. That factory wants 50,000 pigs a year, and as no business can work profitably on half-power, it is no wonder that it lost £1,700 in 1930. Of course, for the last year or more, porkers have made very good prices, but the permanent business is that offered by the bacon-pig, and farmers should take a long view and support the factory through good times and bad. But even if the farmers generally are as shy of forward contracts as the bacon factories have been, it would, none the less, be possible to work up the required connexion by degrees, an individual here and another there, provided the factories took that line of policy.

I come back to my original position that, if the bacon-curers want to ensure supplies that will keep their businesses running economically, and enable them to capture a larger share of the enormous bacon consumption of the country,

they must take some of the risks off the producer and make a price that will give him confidence in developing his output. It would be easy, for example, to fix a contract price, fluctuating with the price of feeding stuffs, whereby the farmer would know what profit he could count on provided his management was up to the mark. He would still have one risk to carry, that of disease, and that is not a light one with pigs, although it can be minimized by care and by quarantining every new pig that it is necessary to bring into the herd.

It is, perhaps, foolish of me to pretend to teach bacon-curers how to conduct their business, but the plain fact is staring us in the face that the production of bacon has stood still in this country for half a century in spite of the expansion in consumption. It will continue to stand still unless there is a change in the methods of marketing that will make pig-production less of a gamble for the farmer. Yet there is no reason why the business should not be done here; the foreigner has no natural advantages, such as he has in growing wheat. He has to buy the food just as we have to do, and the labour factor is not a big one. It is a better organization of the relation between producers and curers that is needed; it is not even necessary that the only producers should be farmers. Pig-keeping requires very little land, so that a smallholder might be enabled to develop a big output of pigs. Mind, I am not arguing that farmers should embark upon bacon factories; their business is to produce and sell, and not to tie themselves up with a skilled processing business. The present bacon-curing equipment in the country is far in excess of the existing turnover and, for aught I know, the bacon-curers are more than competent in their business, but they must organize their sources of supply as other businesses do.

I am talking about bacon-pigs because bacon offers the big market that can be captured from the foreigner; the pork trade is comparatively a small affair and that we have to ourselves. It may be that if we are to get any large portion of the present import trade, the general average of prices will come down, because, just now, in both pork and bacon we are rather doing the luxury end of the business; but, with reasonable organization, there will still be a margin to keep the farmer-producer at work.

(*Concluded.*)

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THE INTERNATIONAL ASSOCIATION OF PLANT BREEDERS

THE BERLIN MEETING, 1931

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THERE is, I think, little doubt that the importance of an international congress lies only partly in the individual papers read and the formal discussions that follow. These may be of inestimable value and an admirable means of becoming acquainted with the latest developments of a science; but in particular they afford an opportunity of judging the trend of modern thought and of noting in which directions the science is progressing most rapidly and absorbing the attention of the greatest number of workers. Indeed, from an international congress may be gained a bird's-eye view of a science and an appreciation of the relative importance of its several branches. It can indicate not only those branches that are most important to-day, but also those that are tending to become questions of the past and those destined to play the biggest part in the future.

All this is true of the Meeting of the International Association of Plant Breeders this year in Berlin. The Congress was opened on the morning of June 11 by Professor Dr. E. Baur, who was followed by municipal representatives in addresses of welcome. The first two lectures of the congress were significant from the present point of view: the first, on breeding of wheat for rust resistance by Professor Dr. O. Appel, dealt with a subject that has already attained the zenith of its importance, as witnessed by the outstanding successes that have been and are being attained in this field in the United States of America and Canada where stem rust is concerned. Professor Appel referred to this work, to the discovery of physiologic forms and to the complication of the problem in Europe by the presence also of brown and yellow rust, each of which has now been shown to consist of a number of physiologic forms. The recent German work on the peculiarities of distribution of these forms was briefly outlined. Such studies are the essential preliminary to breeding for immunity, and particular stress was laid on the part that international effort and co-operation might play in solving these problems not only for Germany but for Europe as a whole.

The second subject to come under discussion was one that is only now beginning to attract the attention of practical

breeders—intergeneric hybrids, with particular reference to wheat and rye. The discussion suffered very considerably from the absence of Professor G. Meister, who was to have given an account of the Russian work at Saratov ; nevertheless we had the good fortune to hear Professor Dr. E. Tschermak-Seysenegg describe his own crosses of rye with all species of wheat, and to see some very interesting slides of the hybrid types. The method is to backcross the hybrids to rye and select the hybrids of the wheat type that display the highest degree of fertility. The object of these crosses is to discover a form suitable for the continental type of climate, early maturing and resistant to cold, drought and lodging, such that it could be grown where now it is only possible to grow rye. Some of the hybrids that have emerged possess these qualities together with vitreous grain, and apparently all that remains to be done is to obtain the pure wheat type. Professor Tschermak also described and illustrated the fertile hybrids of intermediate type having originated by chromosome doubling in crosses between *Aegilops ovata* and *Triticum vulgare* and between *T. turgidum* and *T. villosum*. It is not impossible that such forms should originate in the wheat-rye hybrids, and, indeed, they have been reported by Levitsky and Benetskaja in Russia.

Although Professor Tschermak discussed only these cereal hybrids, he was really dealing with a problem that is beginning to play an extensive part in plant breeding as a whole ; interspecific and intergeneric crosses have long been the dream of the breeder, but only recently have one or two instances like the one under discussion occurred to prove to him that his hopes are not altogether vain.

Another modern tendency was illustrated by Dr. F. Christiansen-Weniger in his discussion of the " land races " of wheat discovered by him in his recent expeditions in Poland and Asia Minor. Arising in all probability from the striking revelations of the Russian geographical studies, the realization has been reached by a number of plant breeders that the old indigenous varieties, although inferior in yield to those so-called high-bred strains that replaced them, yet were vastly superior in many other respects, notably quality and adaptation to local conditions, and the ideal way would have been not to substitute them by the high-yielding strains but to combine, by breeding methods, the qualities of the old types with the increased yield and other advantages of the new types. Accordingly, breeders of many crops are to-day engaged in

attempts to recover the lost types in out-of-the-way places, and Dr. Christiansen-Weniger described the material that he has discovered as being the most varied collection of widely divergent types, varying in winter hardiness, in tillering capacity, in innumerable other characters, and most of all in time of ripening, differences of over four weeks being observed. This material obviously contains numbers of genes which are entirely lacking in the breeding material of the present day, in particular where resistance to extreme climatic conditions is concerned, and it is regarded as an extremely valuable basis for selection and hybridization.

The question of quality was again emphasized by Dr. Ä. Äkerman in his paper, "Breeding Wheat for Grain Quality." Dr. Äkerman emphasized the fact that the quality of a flour does not depend on the amount of protein (or gluten) it contains, but on the quality of the gluten. A recently-introduced new apparatus enables quality tests to be undertaken with very small quantities of dough, and this has greatly facilitated the breeding methods. The inheritance of baking quality has been definitely established, and the results of recent work in Sweden have been to restore to the high-bred wheats, which on account of increased yield, earliness, standing capacity and other qualities have replaced the old land races, the quality to within a few per cent. of that of the best land wheats of South Sweden. Dr. Äkerman briefly described the methods used, and stressed the necessity for uniformity of method in determining quality, and of the adoption of a common standard variety in different laboratories.

In the discussion that followed, Professor Baur urged the adoption of an international standard. Herr Scharnagel and others pointed out the difficulties in this owing to the extreme variation from year to year and under different climatic conditions, but it was agreed that a great deal might be done towards the standardization of methods in small regions having essentially similar conditions and requirements, such, for instance, as the countries of western Europe.

A whole afternoon was taken up in a discussion of the subject of plot tests. One of the most interesting points which arose was the method suggested by Mr. I. S. Papadakis, whereby not one standard variety but several varieties are used for comparison, in this way overcoming the error which the use of any one standard variety may introduce. Opinions differed as to the possibility of attaining a general, absolutely reliable method for use with breeding material, where, as Professor

Baur pointed out, enormous numbers of different forms have to be dealt with in the early stages and any rigid mathematical treatment would appear to be almost impossible.

A large part of another afternoon was taken up by discussions of the desirability and possibility of establishing a plant breeders' "protecting law" to safeguard the interests of those who introduce new varieties on to the market.

The lectures terminated with a very brief discussion by Herr Schmidt of a science that is still in its infancy, but seems destined to play an important part in the agriculture of the future, especially in tropical countries, namely, the Breeding of Forest Plants. The hereditary nature of a certain number of characters has been established, and some were illustrated, among them being the characters wide and narrow crown, flexible stems that bend under the weight of heavy snow, both these being qualities of importance in pine forests in snowy regions; and the peculiarity of bending towards a gap in the plantation, dependent on the heliotropic response of the young plants—a property possessed to varying extents by different strains.

Perhaps a still more valuable service that an international congress can perform is in the contacts that are established, and those entrusted with the organization of the Congress evidently realized this fact. Various social functions were arranged, and it is a great pleasure to have this opportunity of paying tribute to the lavish hospitability with which the Germans entertained the visitors to their country. Excursions were arranged to visit and inspect research institutes and commercial breeding establishments in north and central Germany, and these excursions offered a unique opportunity for visitors to become acquainted and establish permanent relations with representatives of almost every country in Europe. Many members must have had the same experience as the writer, in meeting celebrated figures in plant breeding who had hitherto been represented only by a card in an author index, of establishing with people and institutions relations and exchanges that correspondence had hitherto failed to establish, and reaching an understanding in five minutes where letters had not succeeded in as many months.

The excursions also gave an opportunity for the actual examination of all kinds of material already familiar in print, and of inspecting the laboratories and fields where the experiments were carried out. Thus at the University of Halle a.d. Saale, Professor Roemer gave descriptions and demonstra-

tions of the methods of artificial infection used in studying the inheritance of resistance and breeding varieties of cereals resistant to *Puccinia glumarum*, *P. triticina*, *Helminthosporium* and *Ustilago*. Professor Roemer is working on the principle of introducing from gene centres such as the Himalayas and Japan valuable genes that are lacking in our material and introducing them into this material by hybridization. The scale on which the work is being carried out, the number, variety and fundamental nature of the problems that are being grappled with and solved, were such as to leave the visitors breathless at the end of the evening, asking if they might return at 8 a.m. on the following day to see more. Thus we were shown a Chinese variety of wheat that opens its stomata only in very strong sunlight, otherwise not till about 11 a.m., and is thus fully resistant to rust attack; barleys that are fully immune from *Helminthosporium* and smut; Japanese barleys and oats containing genes for very high degrees of resistance to lodging; wheat resistant to all six forms of *P. glumarum*.

This material has been extensively used in hybridization with the German varieties, the genetics of the various characters being worked out; as a result of this, many strains that combine these valuable new characters with the yield and quality of the German varieties have been created or are in the course of being isolated. In the matter of winter barleys, the cultivation of which is constantly extending, the type that is being built up is one that combines straw of unusual standing capacity and resistance to drought with earliness; some of the hybrids with the Japanese barleys are a whole week earlier and have a correspondingly reduced water requirement. As an example of the value of international co-operation Professor Roemer mentioned the fact that two generations were produced in a year by sending the seed to Buenos Aires to be grown during the German winter. Short-strawed strains of rye that had been produced by inbreeding, and would thus remain homozygous as long as no tall variety was in the vicinity, were demonstrated. In breeding for short straw and long ear it has been found necessary to examine the root system, which is also affected by some of the same genes. Attention was also called to some oat strains that no effort has yet succeeded in lodging, they having arisen by the union of two distinct genes or groups of genes for stiff straw. Five physiologic forms of oat smut have been demonstrated by Reed's method, and selection experiments are being carried

out on smut populations. Numerous factors for earliness in peas have been established and, by transgression, very early valuable types have been produced.

The following morning a visit was made to the laboratories where the apparatus for testing the quality of flour in breeding wheat for baking quality was viewed.

A visit was made during the Congress to the Kaiser Wilhelm Institut für Züchtungsforschung in Münchberg, where the more fundamental aspects of plant genetics are being studied on a very extensive scale. A trip was made round the experimental plots where the interspecific crosses between wheat, rye and *Aegilops* were demonstrated, together with hybrid material of the greatest interest involving every kind of economic plant and the *Antirrhinum* material on which the studies of artificially produced mutations are being carried out.

We also visited the Biologische Reichsanstalt für Land- und Forstwissenschaft in Berlin-Dahlem, where new schemes of classification of wheat and potato varieties were demonstrated, the latter involving a special method of germinating the sets in the light and examining the colour of the sprouts as they emerge. An inspection was made of the experimental plots of the Reichsanstalt and later of the Institut für Acker- und Pflanzenbau of the Landwirtschaftliche Hochschule in Berlin-Dahlem; the latter included some genetical material of *Linum*, involving both flax and linseed types.

Of the commercial breeding establishments visited perhaps the most interesting were those of the family von Lochow at Petkus and the Sugar Factory Kleinwanzleben which, like Halle a.d. Saale, are in the low-rainfall area. At Petkus the methods used in breeding rye were described in some detail by Dr. Laube, who also discussed the relative merit of the various characters that might be used as a basis of selection. A number of characters proved to be valuable criteria, and by taking all these into consideration in making selections very considerable improvement has been effected in the past, in spite of the difficulties resulting from the cross-pollination of the rye plant.

At Kleinwanzleben a brief account was given of the methods used in sugar beet selection, and the historical development of these methods, after which the laboratories and experimental fields were demonstrated.

At the agricultural seed establishments of Frau Strube, Gebrüder Dippe and Heinr. Mette, owing partly to limited time available, it was not possible to see the methods used,

but tours of inspection were made of the trial grounds and multiplication nurseries, where certain of the new creations of the respective concerns were seen. These are pre-eminently types suited to a continental climate, very early, resistant to drought, extreme winter cold and lodging.

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ESTIMATION OF THE YIELD OF SUGAR-BEET FROM EXPERIMENTAL PLOTS: OBSERVATIONS ON THE USE OF A SAMPLE OF 50 BEET

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IN 1928, an experiment was undertaken at the Harper Adams Agricultural College to study the effect on the yield of sugar-beet of varying the distance between the rows and between the plants in the rows. The details of this experiment, together with the results, have already been published* and will not be further discussed here. It is sufficient to point out that the results were based on the total weight of beet on each plot, and not on weighed samples.

Application of Sample Dirt-tare to Total Weight of Dirty Beet on Plot.—Providing an efficient method of sampling were available, it would be possible to dispense with some of the inconveniences of washing and weighing the whole of the produce of a plot. Several investigators had already pointed out that a sample of 50 beet was sufficiently large for an accurate estimation of sugar content in a plot of beet. It was decided to test whether such a sample would be sufficient to give a reasonable approximation to the dirt-tare, so that from the total weight of dirty beet on the plot and the sample dirt-tare, the total weight of clean beet on the plot could be calculated.

Fifty beet were drawn from each plot by taking every nth root, n being determined according to the number of beet on the plot. They were treated in exactly the same manner as the

* Davies, W. M., and Dudley, F. J. Experiments in the Cultivation of the Sugar Beet Crop in the Western Midlands during 1928: *Jour. Agric. Science*, 19, p. 619. See also Davies, W. M. Cultivation of the Sugar Beet Crop: Three Years' Investigation of the Effects of Spacing. This JOURNAL, January, 1931, p. 973.

remaining beet, the leaves and crowns being removed separately. Particular care was taken to knock off as much dirt as possible, in order to get an even distribution of dirt-tare. In spite of all precautions, the dirt-tare (measured by the number of pounds of dirt per hundredweight of dirty beet) varied considerably from sample to sample, and the agreement between the dirt-tare from the sample and that from the whole plot was not always satisfactory.

The dirt-tares of the 64 plots ranged from 13·1 to 31·6 lb. per cwt., the average being approximately 21·5 lb. per cwt. This is a fairly wide variation, which may be due, in some measure, to differences in the soil, in the size of beet, in the proportion of fanged beet, and in the force with which the plants are knocked together. There was, however, no apparent effect due to different spacing, and although no data on fanged roots were collected, it was observed that fanged beet appeared in approximately similar proportions on all plots.

The dirt-tares of the samples of 50 beet varied from 8·6 to 40·6 lb. per cwt., a range which is much greater than that of the plot values. In 43 cases, the sample dirt-tare was higher than the plot dirt-tare ; in 20 cases it was less ; and in one case there was no difference.

The amount of divergence between the two sets of values is summarized in Table I.

TABLE I.

Number of plots on which sample dirt-tare was : greater than plot dirt-tare by lb.		less than plot dirt-tare by lb.	
0·0- 0·9	9	0·1- 1·0	5
1·0- 1·9	9	1·1- 2·0	5
2·0- 2·9	10	2·1- 3·0	2
3·0- 3·9	8	3·1- 4·0	1
4·0- 4·9	0	4·1- 5·0	2
5·0- 5·9	1	5·1- 6·0	3
6·0- 6·9	3	6·1- 7·0	0
7·0- 7·9	1	7·1- 8·0	1
8·0- 8·9	0	8·1- 9·0	0
9·0- 9·9	0	9·1-10·0	1
10·0-10·9	2		
11·0-11·9	0		
12·0-12·9	0		
13·0-13·9	0		
14·0-14·9	0		
15·0-15·9	0		
16·0-16·9	1		
	44		20

Taking the 64 values, the samples gave, on the average, a higher dirt-tare than the plots by about 1·24 lb., a value which introduces an error of only about one-sixth of a ton on a crop of 14 tons per acre of dirty beet.

It must be remembered, however, that in individual cases the discrepancy in the dirt-tare amounts to 5 lb., and even 10 lb. per cwt., whilst in one case the difference reached 16 lb. per cwt.

The effect of errors of 5 and 10 lb. per cwt. in the dirt-tare on unwashed crops of 14 tons and 10 tons per acre, respectively, is shown in Table II.

TABLE II

Error in dirt tare	Weight of crop of unwashed beet per acre	Error in estimate of clean beet
5 lb.	14 tons	0·63 tons
	10 tons	0·45 ton
10 lb.	14 tons	1·25 ton
	10 tons	0·89 ton

The influence of the errors on the yields per acre can be readily seen from the following figures in Table III. Since the experiment was carried out in quadruplicate, there are four figures for each type of spacing.

TABLE III

Width of row	Distance between plants in row			
in.	10 in.	8 in.	6 in.	4 in.
24	0·23	0·44	0·88	−0·41
	0·28	0·25	−0·02	−0·16
	0·02	−0·55	0·11	0·21
	0·28	0·16	0·49	0·54
21	0·18	0·91	−0·73	−1·03
	0·07	0·49	−0·27	0·37
	−1·53	0·36	0·11	0·06
	0·88	0·26	−0·66	2·47
18	0·54	−0·05	0·46	−0·81
	−0·24	−0·83	0·00	−0·31
	0·49	0·40	1·46	0·30
	0·54	0·44	0·11	0·03
15	0·33	0·83	0·37	−0·16
	0·42	0·42	−0·16	0·17
	1·57	−0·15	−0·40	1·20
	−0·60	0·00	0·32	−0·06

The incidence of the error is not clearly connected with the spacing of the plants, although the tendency to under-estimate the dirt-tare is more apparent where the plants are closely spaced than where the spacing is wide.

The majority of the samples gave too high a value for dirt-tare, so that, in the total of four values for each particular spacing, the total effect was nearly always an over-estimation of dirt-tare and a resultant low estimate of clean beet.

In the average of the four values for each type of spacing, the errors tended to cancel out to some extent. It appears that the main conclusions drawn from the plot data would not have been altered materially if the sample data had been used.

The yields calculated from the plot data and the sample data are set out in Table IV.

TABLE IV

Width of row	Distance between plants in row								Average	
	10 in.		8 in.		6 in.		4 in.			
in.	Plot	Sample	Plot	Sample	Plot	Sample	Plot	Sample	Plot	Sample
24	12·05	11·85	12·37	12·30	12·99	12·62	13·11	13·07	12·63	12·46
21	13·41	13·51	12·96	12·46	12·81	13·20	12·94	12·47	13·03	12·91
18	13·61	13·28	13·40	13·41	12·55	12·04	13·55	13·75	13·28	13·12
15	13·12	12·69	13·46	13·18	13·97	13·93	14·14	13·85	13·67	13·41
Av'rge	13·05	12·83	13·05	12·84	13·08	12·95	13·43	13·28	13·15	12·98

It is evident from these results, therefore, that for single plots the use of a sample of 50 beet for the estimation of the yield of clean beet does not always give good results. The replication of treatment in this experiment reduced the error introduced by the use of samples, but in the majority of cases the estimated yield was too low.

Estimation of Yield from Number of Beet on Plot and Weight of 50 Sampled Beet.—From the weight of 50 washed beet and the number of plants per plot, the total weight of clean beet per plot was calculated and the results expressed as tons per acre. In Table V a comparison is made between the averages of the four plots for each type of spacing as determined from the actual plot weights and by the method described above.

In the plots with 10 in. between the plants, where the sample included more than half of the beet, the calculated average was too low, showing that there was a tendency, doubtless unconscious, to pick out the smaller beet for the sample. In the plots with 8 in. between the plants, the sample included nearly

TABLE V

Width of row	Distance between plants in row								Average	
	10 in.		8 in.		6 in.		4 in.			
in.	Plot	Sample	Plot	Sample	Plot	Sample	Plot	Sample	Plot	Sample
24	12·05	11·50	12·37	12·44	12·99	14·10	13·11	14·51	12·63	13·14
21	13·41	12·00	12·96	12·80	12·81	14·11	12·94	15·92	13·03	13·71
18	13·61	12·14	13·40	14·15	12·55	13·35	13·55	18·38	13·28	14·51
15	13·12	11·11	13·46	14·06	13·97	15·33	14·14	18·32	13·67	14·71
Av'rge	13·05	11·69	13·05	13·36	13·08	14·22	13·43	16·78	13·15	14·01

one-half of the beet and the difference was not so great. Where there was a distance of 6 in. between the plants the sample comprised approximately one-third of the whole plot, and in every case gave an average which was too high by about a ton per acre. In the plots with 4 in. between the plants, the sample formed about one-quarter of the whole plot and the calculated yields were, roughly, three tons per acre too high.

This method of estimating plot yields of sugar beet is, therefore, quite unreliable.

Summary.—The estimation of the weight of clean beet on a plot from the total weight of dirty beet and the dirt-tare of 50 sampled beet is in some cases likely to lead to considerable errors for single plots. In the experiment dealt with, replication tended to reduce the error thus introduced and gave, on the average, yields that were slightly below the actual values, but reliable for experimental purposes.

The calculation of the weight of clean beet on a plot from the number of beet and the weight of a sample of 50 beet gave quite unreliable results, even with fourfold replication.

* * * * * *

LIVE STOCK IMPROVEMENT SCHEME

REPORT FOR THE YEAR ENDED MARCH 31, 1931

GREAT Britain has a world-wide reputation for the excellence of its pedigree herds and flocks, which have been brought to their very high standard by the skill and foresight of pedigree breeders over a long period of years, but it is generally agreed that no small proportion of our ordinary commercial cattle is so inferior in quality as to be a source of little, if any, profit to the farmers who rear and keep them. When it is remembered that about 42 per cent. of the total agricultural output of England and Wales is derived from cattle, it will be realized that the grading up of the inferior stock will have an appreciable effect in improving the economic position of agriculture generally.

Until 1914 all efforts to grade up the live stock of the country were left to private individuals, but in that year the Ministry of Agriculture initiated a Scheme for the Improvement of Live Stock, under which grants were made, *inter alia*, for the provision of pedigree bulls for the service, at very moderate fees, of cows belonging to small farmers and small holders.

This Bull Scheme has been slowly but progressively developed, and during the year ended March 31 last 1,537 bulls were subsidized under it. There is good evidence that improvement of cattle has been secured in those districts where the Scheme has been in operation for a number of years, but when it is remembered that the number of bulls subsidized is only about 2 per cent. of the total number (82,816) of bulls in the country, it will be realized that the general improvement in the cattle of the country cannot possibly be secured by the Bull Scheme alone.

Experience has shown, moreover, that in some districts the Scheme has been tried and failed, and that in others it has not been possible even to put it into operation, owing to the competition of bulls that are often quite unsuitable for breeding purposes and whose chief qualification is their very low service fees.

It is essential to get rid of bulls that are unsuitable for breeding purposes if the grading up of our ordinary farm stock is to be secured and the development and benefits of the Bull Scheme are not to be interfered with.

It was for this reason and with this object in view that the Minister of Agriculture decided to introduce the Improvement

of Live Stock (Licensing of Bulls) Bill, and though it has not yet reached the Statute Book there is every reason to think that it will do so, as it has received very general support in both Houses of Parliament.

The Bill has been discussed at numerous meetings of agricultural societies and associations, and it is evident from the reports of many speeches made at these meetings that there is a considerable amount of misunderstanding of the contents of the Bill. It may be of interest, therefore, to bull owners and others if the main features of the Bill are set out briefly here.

The Bill provides that no bull that attains a prescribed age after an appointed day shall be kept without a licence or a permit.

The age will be prescribed by Regulation, and the Minister intends to consult his Advisory Live Stock Committee as to what that age should be.

A licence may be refused if a bull is of defective or inferior conformation and likely to beget defective or inferior progeny, or is permanently affected with any contagious or infectious disease or any other disease rendering the bull unsuitable for breeding purposes.

In the case of the refusal of a licence, the owner of the bull will have the right of appeal, and, when an appeal is lodged, the final decision will depend on the recommendation of a Referee appointed from a panel of Referees constituted by the Minister on the recommendation of agricultural associations and cattle-breeding societies.

The Act will not apply to bulls that have attained the prescribed age before the appointed day, and in England and Wales there will be an interval of not less than three years between the passing of the Act and the date when the requirements as regards licensing may be brought into effect.

The clause of the Bill under which bulls that have been rejected for licensing in Ireland and that have been exported to Great Britain may not be moved alive out of the wharves at which they are landed will, however, take effect immediately on the passing of the Act. In this connexion it may be mentioned that in 1930 as many as 1,451 bulls, that had been rejected for licensing in Ireland, were imported into this country.

The Minister proposes to institute a Voluntary Scheme for the licensing of bulls as soon as practicable after the Bill is passed, and to appoint a Committee to advise him as to the

details of the Scheme and the Regulations to be prescribed in due course under the Act. It is hoped that the Voluntary Scheme, when put into operation, will receive the support of the farming community, and that it will be successful in bringing home to those farmers who have been using unsuitable bulls the necessity of replacing them by better animals.

Reference has been made already to that part of the Ministry's Live Stock Improvement Scheme under which grants are made in respect of bulls. Financial assistance is also given for the provision of boars, and for the encouragement of milk recording and the breeding of heavy horses. The scheme was continued during the year ended March 31, 1931, on similar lines to those of previous years, and the progress of each section of the Scheme is dealt with later in this report. One of the effects of the agricultural depression is that it has often been far from easy to find farmers who are in a position to purchase approved pedigree sires for new Societies; but the fact that there were appreciable increases during the year in the number of premium bulls and boars shows that the good results secured in districts where premium sires have been in use for some time continue to bear fruit in educating farmers to the benefits to be derived from the use of good class sires. When prices are low it is much easier to dispose of well-bred than badly-bred stock, and it is only good quality stock that leaves a profit.

In 1930 there was a further increase in the number of Heavy Horse Societies operating under the Ministry's Scheme, and the number of premium stallions was larger than in any previous year. The small increase in the number of heavy foals in the country in 1930, and the slight rise in the average number of mares served per subsidized stallion last year, afford some indication that heavy horse breeding is beginning to recover from the slump of the past few years.

The number of herds in which milk yields were being recorded officially showed a further small reduction last year, but the average yield of the cows recorded for the full year, viz., 711 gallons, was higher than in any previous year by 21 gallons.

Bulls.—The number of premium bulls in service during the year ended March 31, 1931, was 1,537, an increase of 61 as compared with the previous year, and the average number of services per bull was 65, the same as in 1929-30.

BULL SCHEME

Number of Bulls Subsidized each Year since the Commencement of the Scheme

Year (*April* 1 *to March* 31)	*No. of bulls*	*Year.* (*April* 1 *to March* 31)	*No. of bulls*
1914-1915	497	1923-1924	978
1915-1916	633	1924-1925	1,069
1916-1917	659	1925-1926	1,175
1917-1918	710	1926-1927	1,287
1918-1919	721	1927-1928	1,372
1919-1920	675	1928-1929	1,408
1920-1921	668	1929-1930	1,476
1921-1922	847	1930-1931	1,537
1922-1923	947		

The increase in the number of societies providing bulls under the scheme was distributed over most parts of the country, except in the south and south-east where there were small decreases. In some parts of these districts, where most of the small farmers are milk-sellers, it is difficult to keep members of societies loyal in their support of the premium bulls. Various reasons are suggested for this attitude, but it appears to be largely due to the indifference of many dairy farmers as to the quality of the bulls they use. There are, however, other parts of these areas where the premium bulls are well supported, and the holding of a small but successful show of the progeny of three premium bulls in one part of Kent, and the decision of the County Agricultural Society to offer prizes at this year's show for non-pedigree stock sired by premium bulls, may be expected to secure some improvement in this county, where the number of premium bulls has declined from 26 to 19 in the last three years.

It is pleasing to turn from these areas, where the demand for approved pedigree bulls is disappointing, to other parts of the country where there is a keen desire among many of the small farmers to improve the quality of their cattle. In Yorkshire, for example, there were 15 more premium bulls in service in 1930-31 than in the previous year; Shropshire showed an increase of 8; and in Devon, Cornwall, Hereford and Wales not only are all the available grants taken up, but the number of cows sent to the bulls is well above the average, frequently exceeding 100 in the year, and sometimes exceeding 150.

The scheme for the marking of calves sired by the premium bulls provided by the societies affiliated to the Bletchley and District Live Stock Improvement Society, to which reference was made in last year's report, has made satisfactory progress. Marking was commenced in January, 1930, and by April

this year 250 heifer calves were earmarked and registered. The Society hopes in a few years to be in a position to hold collective sales of earmarked cattle, and in the meantime interest in the work of the Society is stimulated by the holding of an annual show of premium bulls and their progeny. Similar schemes for the earmarking of calves sired by premium bulls are being operated by three Bull Societies in Staffordshire, and it is reported that practically all the calves marked by these societies are retained for breeding. Steps are now being taken to form an Association of Bull Societies in the counties of Brecon, Monmouth and Radnor, where 71 premium bulls were located in 1930-31, with the object of earmarking the progeny, and subsequently disposing of earmarked stock. It is hoped that success will attend the efforts of this Association.

The long list of prizes won by premium bulls and their progeny at Agricultural Shows in 1930 testifies to the general quality of the bulls provided, under the scheme, for the use of small farmers; while a number of successes at the most important shows, including the provision of the Champion Devon bull at both the Royal and Bath and West Shows, and the reserve Champion (a Shorthorn bull) at the Royal Welsh Show, are evidence of the very high standard of some of the premium bulls. Several Live Stock Officers report that there is a desire on the part of pedigree breeders to secure premium bulls for use in their herds after these bulls have proved their worth when located with a bull society. One bull, which had served nearly 400 cows during the three years that it was available for the use of a society, and had kept its condition so well as to be the winner of many prizes at shows, was sold to a pedigree breeder for 120 guineas.

Breeds and Prices.—The table overleaf shows the number and average prices of the premium bulls of each breed located under the scheme in each of the last three years.

The average price paid for all the subsidized bulls shows little variation from year to year, but the average prices of the Shorthorns and Welsh Blacks were somewhat reduced in 1930-31, while those of the three other most numerous breeds of premium bulls, viz., Devons, Herefords, and Lincoln Reds, were increased. Shorthorns maintain their pre-eminence as regards numbers, nearly 56 per cent. of the bulls provided in 1930-31 being of this breed, and the only counties where Shorthorns are not represented among the premium bulls are Lincoln, Devon and Anglesey.

NUMBERS AND AVERAGE PRICES OF BULLS OF EACH BREED

Breed	1928-29				1929-30				1930-31			
	No.	Average cost			No.	Average cost			No.	Average cost		
		£	s.	d.		£	s.	d.		£	s.	d.
Aberdeen-Angus	9	48	5	1	13	46	8	11	10	47	15	10
British Friesian	1	47	5	0	1	47	5	0	3	65	4	0
Devon	152	52	9	4	168	53	5	4	183	53	12	2
Galloway	1	27	6	0	1	24	3	0	2	24	11	6
Guernsey	18	39	15	5	16	41	10	7	17	43	11	10
Hereford	156	47	12	5	175	46	10	6	186	47	1	6
Lincoln Red	180	47	17	1	176	47	8	10	175	49	2	10
Red Poll	1	42	0	0	2	41	0	0	1	42	0	0
Shorthorn	764	49	8	1	800	49	5	9	842	48	4	1
South Devon	10	43	0	10	8	44	17	7	8	54	19	3
Sussex	5	39	11	10	5	40	6	5	7	41	5	3
Welsh Black	71	32	9	11	74	33	3	2	71	31	3	5
All Breeds	1,368	48	4	5	1,439	48	3	4	1,505*	47	19	6

*1,537 bulls were located, but grants in respects of 32 were in suspense at the end of the year.

Service Fees.—The service fees charged for the use of the premium bulls are shown below :—

Year	2/6	3/-	3/6	4/-	4/6	5/-	5/6	6/-	6/6
1928-29	62	53	37	96	10	802	15	118	4
1929-30	77	53	39	103	11	855	15	111	4
1930-31	70	53	46	111	13	896	12	126	10

Year	7/-	7/6	8/-	8/6	9/-	9/6	10/-	10/6
1928-29	11	132	7	2	—	—	16	3
1929-30	7	139	8	1	—	—	13	3
1930-31	4	144	6	2	—	—	10	2

Each year a larger proportion of the service fees is fixed at 5*s.* Practically 60 per cent. of the societies charged this fee in 1930-31, while nearly 20 per cent. charged less than 5*s.* per service. In Wales 95 per cent. of the service fees were 5*s.* or less, and 12½ per cent. only 2*s.* 6*d.*

Boars.—The number of applications for grants in respect of boars increased during the year under review, and 1,047 boars were provided under the scheme, an increase of 75 over the preceding year. The table (top of p. 505) shows the number of boars in respect of which grants have been paid each year.

The agricultural returns collected in June, 1930, indicated that farmers had at that date begun to increase the numbers of their breeding sows from the much reduced figures of the previous year, and the number of sows sent for service to the premium boars suggests that this increase was maintained. The average number of services per boar in 1930-31 was 60,

BOAR SCHEME

Number of Boars Subsidized each Year since the Commencement of the Scheme

Year (*April* 1 *to March* 31)	*No. of boars*	*Year* (*April* 1 *to March* 31)	*No. of boars*
1914-15	115	1923-24	638
1915-16	193	1924-25	655
1916-17	216	1925-26	710
1917-18	264	1926-27	844
1918-19	350	1927-28	907
1919-20	399	1928-29	933
1920-21	441	1929-30	972
1921-22	550	1930-31	1,047
1922-23	569		

as compared with only 51 and 54 respectively in the years 1929-30 and 1928-29.

The educative value of the provision of premium boars is evidenced by the fact that in a large number of instances applications for grants can be traced to the benefits secured in other districts from the use of the approved pedigree boars. Many reports are received of the good prices obtained for pigs sired by the premium animals. Two examples may be quoted from different parts of the country. A farmer in one of the south-eastern counties sold 20 Large Black gilts by a premium boar out of non-pedigree sows for just over £8 each, at rather under 6 months old, while 5 porket pigs sired by a premium boar made £4 15*s.* 0*d.* each when under 12 weeks old at a market in a north-western county. Pigs sired by premium boars again secured many of the prizes at Christmas fat stock sales, including a second prize at the Smithfield Show.

Breeds and Prices.—The demand for the Large White boar is becoming more general throughout the country, and the number of such boars subsidized during the year covered by this report was 775. This is 75 per cent. of the total number of premium boars as compared with 40 per cent. six years ago. The Cumberland pig is still popular in the county from which it derives its name and one or two adjoining counties ; the Middle White and Berkshire are kept in considerable numbers in three or four counties near London, and there are a good proportion of Large Black and Long White Lop-Eared pigs in Devon and Cornwall. Elsewhere the Large White is the most favoured breed.

The average price of the premium boars in service in 1930-31 was £13 6*s.* 1*d.*, or 7*s.* 6*d.* per head more than in the previous year, and the highest average since 1924-25. All the more numerous breeds showed increases on the year, Large Whites averaging £13 8*s.* 5*d.* per head, a rise of 5*s.* 6*d.*

NUMBER AND AVERAGE PRICES OF BOARS OF EACH BREED

Breed	1928-29				1929-30				1930-31			
	No.	Average price			No.	Average price			No.	Average price		
		£	s.	d.		£	s.	d.		£	s.	d.
Berkshire	22	12	8	8	24	12	18	2	20	12	14	5
Cumberland	54	12	0	8	46	13	2	4	51	13	8	8
Gloucester Old Spots	6	13	7	2	4	15	10	3	2	20	5	0
Large Black	47	11	18	7	44	11	14	3	37	11	19	6
Large White	589	13	4	8	665	13	2	11	775	13	8	5
Large White Ulster	6	12	19	2	6	10	19	0	5	13	12	0
Lincoln Curly Coated	27	9	10	6	21	10	5	7	17	11	11	9
Long White Lop-eared	58	13	2	7	53	11	7	6	51	13	9	7
Middle White	92	12	6	5	70	12	5	8	57	12	19	4
Tamworth	—	—			1	9	0	0	1	9	0	0
Wessex Saddleback	12	13	7	5	10	12	13	5	8	13	1	2
Welsh	4	10	17	9	3	10	13	4	9	12	12	11
All breeds	917	12	17	3	947	12	18	7	1,033*	13	6	1

*1,047 boars were located, but grants in respect of 14 were in suspense at the end of the year.

Service Fees.—The service fee charged for more than 72 per cent. of the premium boars is 5*s.*, and less than 5*s.* is charged for over 11 per cent. of the boars. The higher fees mostly occur in the north, 36 of the 69 service fees of 7*s.* 6*d.* being in Cumberland, Westmorland, Northumberland, Durham and Lancashire, and 5 of the 9 fees of 10*s.* in Cumberland.

Year	2/6	3/-	3/6	4/-	4/6	5/-
1928-29	3	12	16	60	6	654
1929-30	3	9	17	63	6	690
1930-31	3	9	20	76	9	751
Year	5/6	6/-	6/6	7/-	7/6	10/-
1928-29	1	65	3	4	87	6
1929-30	2	72	5	2	73	5
1930-31	2	78	5	2	69	9

Rams.—Two additional grants were made in 1930 in respect of rams provided under the Scheme for the Improvement of Welsh Mountain Sheep. Under this scheme a limited number of rams has been used each year since 1919, and in areas where societies have operated for a period of years notable improvement in the sheep of the district has been effected, thereby affording practical demonstration of the benefits to be derived from the use of a carefully selected ram of good breeding. The fact that sheep farming has been fairly profitable for some years may account to some extent for the increased interest shown in the grading up of hill flocks in Wales, but, in view of the evidence of the improvement effected where

premium rams have been used and the corroborative testimony of hill farmers, there is no doubt that the premium ram scheme has proved very successful in helping farmers to realize the possibility of improving their flocks by the use of good rams. The finding of suitable enclosures for the ram and selected ewes during the service season frequently presents some difficulty in operating this section of the scheme.

In 1930, 27 rams were hired by societies operating under the scheme, and 1,613 ewes were served at fees varying from 1*s.* to 3*s.* 6*d.* per ewe. The hiring fees paid for the rams ranged from £6 to £12 per head.

Horse Breeding :—*Heavy Horses.*—The number of heavy horses bred in England and Wales has decreased considerably in recent years. In the hope of arresting this decline, and in order to give further encouragement to farmers to breed heavy horses, the maximum direct grant payable to Heavy Horse Societies was increased for the 1930 season from £40 to £60 per stallion, while the maximum hiring fee and service fee of stallions in respect of which grants are payable were increased to 400 guineas and 4 guineas respectively, as compared with 300 guineas and 3 guineas in previous years. As a result, a number of new societies were formed in 1930 to operate under the Ministry's scheme, and some societies whose financial position had become unsatisfactory were encouraged to continue. Grants were made to 125

HEAVY HORSE SCHEME

Service season	*No. of stallions*	*Total No. of mares served*	*Average No. of mares served*	*No. of assisted nominations*	*Average hiring fee of stallions*	*Average service fee*
					£	£ s. d.
1914	72	6,365	68	1,503	231	2 8 6
1915	97	9,122	94	2,430	241	2 9 6
1916	108	9,995	92	2,181	244	2 11 0
1917	110	10,556	96	2,151	258	2 16 3
1918	122	12,281	100	2,165	285	2 15 8
1919	118	10,920	96	1,996	317	3 6 3
1920	105	9,133	87	1,839	345	3 13 1
1921	101	7,888	78	1,943	333	3 13 7
1924	87	6,098	70	*	178	2 7 0
1925	96	7,413	77	1,723	194	2 8 4
1926	98	8,165	83	2,171	208	2 8 6
1927	105	8,950	85	2,599	211	2 8 9
1928	114	9,792	86	2,805	217	2 9 4
1929	120	10,196	85	3,052	221	2 9 9
1930	140	12,248	87	3,604	239	2 11 1

*No grant was made by the Ministry for assisted nominations (except to the Cumberland and Westmorland Society) for the service season 1924.

societies travelling 140 stallions, compared with 109 societies and 120 stallions in 1929. Most of the stallions travelled by subsidized societies are Shires, but Clydesdales predominate in the North of England, and a few societies in the Eastern Counties travel Suffolks. In 1929-30 grants were made in respect of 119 shires, 17 Clydesdales and 4 Suffolk stallions.

The above figures do not include those relating to the Cumberland and Westmorland Society, which issues assisted nominations to selected stallions travelled by their owners in these counties. The numbers of such nominations issued by this society each year since its formation in 1915 have been as follows :—

Service season	*No. of assisted nominations*	*Service season*	*No. of assisted nominations*
1915	385	1924	121
1916	394	1925	197
1917	328	1926	220
1918	321	1927	247
1919	264	1928	281
1920	254	1929	283
1921	255	1930	269

The total number of mares served by the stallions travelled by subsidized societies in 1930 was 12,248, an increase of 2,052 on 1929, and assisted nominations were awarded to 3,873 small farmers, an increase of 538 on the year. The increase, though small, in the average number of mares served per stallion—*i.e.*, 87 as compared with 85 in 1929—and the increase from 22,833 to 23,405 in the number of heavy foals included in the annual agricultural returns of 1930, perhaps indicate that the decline in heavy horse breeding has been arrested. The average hiring fee, £239, and average service fee, £2 11*s.*, of the subsidized stallions were somewhat higher than in 1929.

The scheme encourages not only more breeding, but the use of better class stallions, more particularly by the small farmers who receive part payment of the service fees. The formation of a society in any district is generally the means of introducing into the area a much better stallion than has formerly been available, and the assisted nominations for small farmers encourages them and enables them to use the society's stallion. In one area the travelling of stallions by a new society is reported to have been the means of ousting from the district three inferior animals.

The Ministry has been furnished with returns of the results of the services made by subsidized stallions in 1929, and these show that on the average about 59 per cent. of the mares proved to be in foal.

Horse Breeding Act, 1918.—The number of stallions licensed under the Horse Breeding Act, 1918, in England and Wales for the 1930 service season was 1,430, and there was thus little change as compared with the previous season, when 1,436 stallions were licensed. The number of licences issued and the number of refusals in each year since the Act came into force have been as follows :—

Year (ending October 31)	*No. of applications for licences*	*No. of licences issued.*	*No. of refusals*
1920	4,153	3,749	404
1921	4,060	3,816	244
1922	3,644	3,479	165
1923	2,897	2,761	136
1924	2,285	2,210	75
1925	1,908	1,849	59
1926	1,664	1,608	56
1927	1,574	1,537	37
1928	1,454	1,414	40
1929	1,472	1,436	36
1930	1,472	1,430	42

Heavy stallions accounted for 1,087 of the licences issued for the 1930 season, there being decreases of 8 and 5 in Shires and Clydesdales respectively, while Suffolks increased by 10 and Percherons by 1 as compared with 1929. There were, however, more licensed stallions of each of the four heavy breeds than in 1928. For the fourth year in succession Thoroughbreds showed an increase, and 184 stallions of this breed were licensed against 166 in 1929 and 138 in 1926. Most of the other breeds of light horses showed some decline.

A comparison of the numbers of stallions of the different breeds licensed in 1930 with those of 1920, the first year in which the Horse Breeding Act was in force, is given in the following table :—

NUMBER OF STALLIONS LICENSED IN ENGLAND AND WALES IN 1920 AND 1930

Breed or type	*Number licensed* 1920	1930	*Percentage decrease*
Heavy—			
Shire	2,430	752	69·1
Clydesdale	296	128	56·8
Suffolk	197	139	29·4
Percheron	42	42	—
Other Heavy Horses ..	54	26	51·9
Total Heavy Horses ..	3,019	1,087	64·0
Light—			
Thoroughbred	185	184	0·5
Hackney	243	32	86·8
Welsh Cob	89	32	64·0
Other Light Horses & Ponies	213	95	55.4
Total Light Horses & Ponies	730	343	53·0
Grand Total	3,749	1,430	61·9

Amongst heavy horses, Shires showed the sharpest decrease over the ten-year period, and while Thoroughbreds have maintained their position there has been a reduction of nearly 87 per cent. among Hackneys.

Applications for licences for the 1930 season were refused in respect of 42 stallions, an increase of 6 as compared with 1929, but only 5 appeals were lodged as compared with 12 in 1929. Three of the 5 appeals were successful. The reasons for the rejection of the 42 stallions were as follows :—

Roaring	6	Stringhalt	4
Whistling	8	Shivering	2
Sidebone	9	Defective Genital Organs	1
Ringbone	6	"Tubed" and could not be examined for wind	1
Cataract	5		

Of the rejected stallions 37 were of heavy breeds and 5 of light breeds.

During the season the Ministry received reports of 14 infringements of the Act, the same number as in 1929. Three unlicensed stallions were found travelling for service, and two unlicensed stallions were reported as being exhibited, with a view to their use for service, on premises not in the occupation of the owners. Proceedings were taken by the police in four cases and three convictions were recorded, while the fourth case was dismissed under the First Offenders Act. It was reported that nine licensed stallions were being travelled unaccompanied by the licences, and the owners were warned that it was necessary that the licences should be carried.

Milk-Recording.—The average milk yield of cows recorded under the Ministry's Scheme in 1929-30 was appreciably higher than in any previous year, and for the first time cows recorded for the full year gave on the average over 700 gallons of milk per head. In the early years of milk recording in this country, the corresponding yield of milk was under 600 gallons, and the increase of 112 gallons per head as compared with 1917-18, when all societies were required to adopt a uniform milk-recording year, is a good achievement, and a proof that milk-recording has led to an improvement in the milking capacity of our dairy cattle.

Apart from the economy attaching to increased milk yields, farmers who have graded up their animals as regards milking capacity also obtain improved prices for their stock. At the annual sale of recorded cattle held by the Lancashire Milk Recording Society in November last, 26 non-pedigree Shorthorn cows and heifers averaged £33 per head—estimated to

be well above the ordinary commercial price—while under this Society's scheme for the sale of earmarked calves, good prices are secured and the demand for the calves exceeds the supply. From other districts, also, come reports of good prices obtained for cattle and calves from recorded herds. As an indication of the commercial value of authenticated milk records, a firm of auctioneers in the Midlands is prepared, for a small charge, to circularize its principal buyers of good dairy cattle and the members of the local milk-recording society when a member of the society wishes to sell recorded cows. The result is that cows with good records make several pounds per head more than they would have done without such records.

In these circumstances it may occasion some surprise that the number of members of milk-recording societies should have declined during the past three years, but, as has been stated in previous reports, the reason is to be found in the agricultural depression. This has made farmers anxious to reduce their expenditure, and reluctant to increase their outgoings. It has, therefore, been difficult for societies to recruit new members, while some members, more particularly those who sell all their milk and rear few, if any, calves, have resigned from the societies in order to save their subscriptions and levies, as they have considered that private recording is sufficient for their purposes. The decline in official recording does not, therefore, necessarily mean that fewer herds are being recorded, and a Live Stock Officer in the Home Counties estimates that there are as many herds being recorded privately as officially in one of these counties.

The following table shows the number of members of milk-recording societies, together with the number of herds and cows recorded, in each year since 1917-18, when all societies were required to adopt a uniform milk-recording year. It will be noticed that, although the number of herds recorded declined by 131, or 2½ per cent. in 1929-30, this decrease was only half that of the previous year.

Year ended October 1	*Societies*	*Members*	*Herds*	*Cows*
1917-18	27	639	708	19,793
1918-19	38	1,191	1,332	37,880
1919-20	46	2,075	2,312	61,323
1920-21	52	3,328	3,664	97,903
1921-22	55	3,949	4,362	117,023
1922-23	55	4,365	4,767	127,151
1923-24	52	4,764	5,209	138,086

Year ended October 1	*Societies*	*Members*	*Herds*	*Cows*
1924-25	50	5,081	5,516	148,905
1925-26	49	5,174	5,656	154,322
1926-27	51	5,166	5,650	156,847
1927-28	50	4,862	5,320	149,971
1928-29	50	4,616	5,065	144,812
1929-30	49	4,501	4,934	140,266

Average Yield of Recorded Cows.—The number of cows and heifers recorded under the Ministry's scheme in 1929-30 was 140,266, of which 71,432 were cows that had been in the recorded herds for the whole of the year. The number and average yield of milk of all cows recorded, and of full-year cows, for each year since 1917-18 is given in the table below :—

Year October 1 to October 1	Particulars of all cows and heifers recorded			Particulars of cows recorded for full year			
	No. of cows and heifers	Total yield	Average yield*	No. of cows	Percentage of total cows and heifers	Total yield	Average yield*
		Gal.	Gal.			Gal.	Gal.
1917-18 ..	19,793	8,426,958	426	8,775	44	5,255,923	599
1918-19 ..	37,880	16,204,941	450	17,989	47	10,543,516	579
1919-20 ..	61,323	29,344,887	479	27,266	44	17,363,347	637
1920-21 ..	97,903	48,512,380	495	48,248	49	30,892,620	640
1921-22 ..	117,023	60,463,617	517	63,318	54	41,208,073	651
1922-23 ..	127,151	67,904,224	534	68,349	54	46,956,565	687
1923-24 ..	138,086	73,963,165	535	73,338	53	50,299,884	685
1924-25 ..	148,905	76,419,498	*513	77,132	51	51,695,291	*670
1925-26 ..	154,322	81,623,788	*529	81,669	53	56,102,434	*687
1926-27 ..	156,847	82,161,809	*524	81,749	52	55,677,261	*681
1927-28 ..	149,971	76,896,131	*513	77,171	51	51,931,633	*673
1928-29 ..	144,812	75,948,485	*524	74,171	51	51,207,594	*690
1929-30 ..	140,266	75,293,001	*537	71,432	51	50,766,464	*711

*Before 1924-25 the average yield was calculated at the equivalent of 10¼ lb. to a gallon, and subsequently at 10⅓ lb.

The average yield of full-year cows in 1929-30 was 7,344 lb. (711 gal.) or 210 lb. (approximately 21 gal.) more than in 1928-29, and 31 gal. above the average of the five years 1924-29. Only 3 of the 49 societies did not secure increased yields in 1929-30, and for two of these the decreases were negligible, being no more than about one gallon per cow. In 1927-28 there were only 3 societies, and in 1928-29, 8 societies, that had average yields of full-year cows exceeding 7,500 lb. (726 gal.) per cow, but in 1929-30 as many as 21 societies returned average yields exceeding this figure and 3 societies exceeded 8,000 lb. (774 gal.) per cow against one in 1928-29. The highest averages were secured by the Staffordshire Society, 8,112 lb. (785 gal.),

Northumberland Society 8,110 lb. (785 gal.) and Norfolk Society 8,007 lb. (775 gal.).

Individual herds with average yields for full-year cows of 8,000 lb. (774 gal.) or over numbered 1,335, or slightly over 30 per cent. of the total number of herds recorded for the full year, this comparing with 25 per cent. in 1928-29 and 20 per cent. in the previous year. The number of herds with averages of over 10,000 lb. (968 gal.) per cow also showed a very appreciable increase, being 251 against 178 in 1928-29. A few examples are given in the following table of the increases secured in the average yields of herds as the result of recording, and these indicate that much improved returns are obtained in individual herds as a result of the more careful attention that recording engenders.

Herd	No. of years during which records have been taken	Average yield per cow in first year	Average yield per cow in last year	Increase in annual average yield per cow	No. of full year cows in last year of period	Cash value of increase of last year over first year at 1s. per gallon	
						Per cow	Per herd
		Gal.	Gal.	Gal.		£ s.	£ s.
A (Pedigree Red Poll) ..	7	694	1,065	371	19	18 11	352 9
B (Non-Pedigree Shorthorn) ..	11	539	837	298	16	14 18	238 8
C (Mainly Pedigree Friesian)	5	686	993	307	13	15 7	199 11
D (Non-Pedigree Shorthorn) ..	4	878	1,126	248	16	12 8	198 8
E (Pedigree Jersey) ..	5	700	877	177	12	8 17	106 4

The total number of cows and heifers of certain breeds recorded in England and Wales during the year ended October 1, 1930, and the number and average yield of the cows recorded for the full year, together with the percentage of full-year cows, are shown in the table at top of p. 514.

Shorthorns, which accounted for 61 per cent. of the total cows and heifers recorded, averaged 7,193 lb. (696 gal.), an increase of 207 lb. (20 gal.) on the year, while Friesians averaged 8,702 lb. (842 gal.), an increase of 319 lb. (31 gal.). Welsh Blacks showed the largest increase on the year at an average of 6,061 lb. (587 gal.) against 5,695 lb. (551 gal.) in 1928-29.

Although the total number of cows recorded declined as compared with 1928-29, more Guernseys, Jerseys, Red Polls

Breed or type	Total number of cows and heifers recorded	Particulars of cows recorded for full year			
		Number	Percentage of total cows and heifers	Total yield	Average yield
				lb.	lb.
Ayrshire	2,582	1,410	54·6	10,615,821	7,529
Blue Albion	1,076	591	54·9	4,441,930	7,516
Devon	1,260	731	58·0	4,258,563	5,826
Friesian	22,122	12,306	55·6	107,088,138	8,702
Guernsey	8,775	3,951	45·0	25,257,682	6,393
Jersey	5,201	2,610	50·1	16,414, 352	6,289
Lincoln Red	2,569	1,402	54·5	10,305,436	7,351
Red Poll	5,478	3,061	55·8	21,728,394	7,098
Shorthorn	85,580	42,603	49·7	306,464,626	7,193
South Devon	2,245	1,030	45·8	7,028,142	6,823
Welsh Black	1,053	582	55.2	3,527,758	6,061

and Welsh Blacks were recorded. The increases in these breeds were, however, relatively small, except as regards Guernseys, of which 745 more cows and heifers were recorded, an increase of 9 per cent. Guernseys thus accounted for 6¼ per cent. of the total number of cows recorded, against 5½ per cent. in 1928-29.

NUMBER OF COWS THAT GAVE THE STANDARD YIELD PRESCRIBED FOR THEIR BREED OR TYPE DURING THE YEAR ENDING OCTOBER 1, 1930, CLASSIFIED ACCORDING TO BREED AND YIELD.

Breed or type	Standard yield	Yields (in lb.)								Total number of cows giving the standard yield
		8,000 to 9,000	9,000 to 10,000	10,000 to 11,000	11,000 to 12,000	12,000 to 14,000	14,000 to 16,000	16,000 to 20,000	Over 20,000	
	lb.									
Ayrshire	9,000	—	173	108	50	51	6	3	—	391
Blue Albion	9,000	—	78	43	28	20	3	1	—	173
Devon	8,000	52	19	11	4	2	1	—	—	89
Friesian	10,000	—	—	1,547	985	980	324	146	21	4,003
Guernsey	8,000	510	243	97	50	26	5	—	—	931
Jersey	8,000	279	132	73	24	19	4	—	—	531
Lincoln Red										
Shorthorn	9,000	—	160	91	39	40	3	3	—	336
Red Poll	9,000	—	308	170	79	73	14	—	—	644
Shorthorn	9,000	—	4,634	2,467	1,203	796	156	42	5	9,303
South Devon	8,000	159	85	57	17	18	4	1	—	341
Welsh Black	8,000	68	19	11	3	5	—	—	—	106
Other Breeds	8,000	71	49	24	4	10	2	—	—	160
Totals	—	1,139	5,900	4,699	2,486	2,040	522	196	26	17,008

The number of cows that reached the standard yield for their breed or type in 1929-30 was 17,008 as compared with 15,065 in 1928-29 and 13,539 in 1927-28. These increases are the more significant when it is remembered that in each of the last two years there was a decrease in the total number of cows recorded. The number of Shorthorns that gave the standard yield of the breed increased from 8,299 in 1928-29 to 9,303 in 1929-30, while Friesians increased from 3,377 to 4,003 and Guernseys from 813 to 931. The total number of cows with yields of 10,000 lb. or over was 9,969 against 8,605 in the previous year, while 26 cows exceeded 20,000 lb. of milk in the year against 22 in 1928-29.

Number of Days Cows are in Milk.—During the past year the annual returns received from members of Milk-Recording Societies were tabulated for the purpose of ascertaining the average number of days in milk of the cows recorded for the full year in 1928-29. Over 65,000 full-year cows were covered by this tabulation and on the average these cows were in milk for 293·7 days, were dry for 62·9 days and suckled calves for 8·2 days (including the first 4 days after calving, irrespective of whether the cow suckled a calf or not).

Issue of Certificates.—The number of Certificates of Merit that have been issued in respect of the three years ended October 1, 1930, is 278, a small decrease of 14 as compared with the corresponding figure for the previous year, while 10 such certificates have been issued during the past year for previous three-year periods. Certificates of Merit are only awarded, on application by the owners and on payment of a fee of 5*s.*, for cows that have given during a three-year period the prescribed yield of milk for their breed or type and have been regular breeders. The highest yields certified for the different breeds were Friesian, 60,702 lb.; Shorthorn, 45,371 lb.; Guernsey, 43,756 lb.; Lincoln Red Shorthorn, 41,884 lb.; Red Poll, 38,789 lb.; Jersey, 35,458 lb.; Ayrshire, 35,114 lb.; Park Cattle 34,049 lb.; and South Devon, 32,571 lb. Full particulars of the Certificates of Merit issued have already been published in Volume XIV of the Register of Dairy Cattle.

Only 48 Certificates of Milk Record were applied for in respect of the records of cows for the single year 1929-30, as compared with 93 in the previous year.

Register of Dairy Cattle.—Volume XIV of the Register of Dairy Cattle was published in May. For some years the Register had contained particulars of 7,500 of the highest yielding cows of the year, but the cost of printing these par-

ticulars had resulted in appreciable charges on public funds. Replies received from Milk-Recording Societies in answer to inquiries made with the object of placing the Register on a self-supporting basis, indicated that the Register was not considered of sufficient value to justify such a charge being made for it to members of Milk-Recording Societies that the cost of publication would be covered. In order to reduce the cost of production the Ministry, therefore, decided to omit the records referred to above, and to limit Volume XIV to (1) the list of cows in respect of which Certificates of Merit have been awarded, and (2) the Register of Pedigree Bulls for Dairy Herds. At the same time it was decided to charge a fee of 5*s*. for each bull entered in the Register. Particulars are included in Volume XIV of 288 cows awarded Certificates of Merit and of 13 pedigree dairy bulls.

Calf and Bull Marking.—In 1929-30 there was a small increase in the number of calves marked under the Ministry's Scheme for the marking and registration of calves of milk-recorded cows, the number marked being 13,680 against 13,483 in 1928-29. As usual, most of these were heifer calves, only about 1,100 being bull calves. Of the bull calves marked over 20 per cent. were in Cumberland and Westmorland, and nearly 14 per cent. in Devon. The number of bulls in service that were marked by Milk Recording Societies in 1929-30 was 53.

Testing for Butter Fat.—The number of samples taken by Recorders for testing for butter fat in 1929-30 was 127,877, an increase of 2,686 as compared with the previous year. The increase was wholly in respect of the milk of individual cows, of which over 106,000 samples were taken, the number of bulk samples showing a decrease of about 9 per cent.

Rationing.—The best results as regards milk production can only be obtained if the herd owner pays careful attention to the quantity and quality of the feeding stuffs supplied to his cows. Milk-Recording Societies assist their members in this respect by putting them in touch with the advisory services. Further, it is only by recording the yields of their cows that herd owners are in a position to feed individual cows according to their yields, a practice which is necessary if cows are to yield to their highest capacity.

Reports received by the Ministry indicate that an increasing number of members of Milk-Recording Societies are seeking advice on the rationing of their herds, and by this means are securing economies in feeding and improvement in yields.

MILK-RECORDING SOCIETIES

Statement giving particulars of the 49 Milk-Recording Societies operating during the year ended October 1, 1930. (The Societies are arranged in order of total number of cows recorded.)

SOCIETY	*No. of members	*No. of herds	Total No. of cows recorded	No. of cows recorded for full year	Average yield of cows recorded for full year
					lb.
Essex County	206	236	9,695	4,899	7,899
Hampshire	198	228	7,613	3,987	6,738
Suffolk	262	293	7,603	4,480	7,972
Somerset and North Dorset	195	222	6,973	3,726	7,041
East Sussex	205	232	6,726	3,299	6,853
Norfolk	205	223	6,288	3,750	8,007
Berkshire	161	189	6,139	3,248	7,078
Hertfordshire County	163	188	5,532	2,503	7,594
North Wilts	94	121	5,528	2,903	6,794
Kent	130	149	4,270	2,299	7,055
Dorset	66	96	4,106	2,619	6,555
West Sussex	111	127	4,083	2,004	7,419
Surrey	137	144	4,067	1,886	7,073
Lancashire County	113	119	3,606	1,233	7,385
Gloucestershire	108	116	3,448	1,886	7,468
Shropshire	83	85	3,247	1,706	7,653
Oxfordshire	97	102	3,142	1,720	7,428
Warwickshire	123	131	3,069	1,466	7,492
Leicestershire and Rutland	98	102	2,750	1,329	7,438
Buckinghamshire	92	101	2,491	1,176	7,531
Yorkshire	100	108	2,422	901	7,567
South Devon and District	101	105	2,277	1,038	6,818
Cambridgeshire and District	71	81	2,184	1,136	7,525
Cheshire County	56	60	2,132	968	7,799
Derby and District	61	62	2,110	911	7,974
South Wilts	35	46	2,060	1,294	7,332
Staffordshire	60	61	2,011	918	8,112
Northamptonshire	72	81	1,931	866	7,121
Cumberland and N. Westmorland	96	96	1,796	726	6,274
Bristol and North Somerset	74	79	1,742	897	7,184
Worcestershire	75	76	1,696	869	7,493
Bedfordshire	55	57	1,650	814	7,593
Nottinghamshire	47	50	1,549	650	7,664
Northumberland	60	62	1,306	727	8,110
Lincolnshire	41	45	1,292	691	7,613
East Devon	72	72	1,240	657	6,809
Durham County	41	44	1,178	497	7,955
Peak (Derby)	50	51	1,147	479	7,806
Cornwall	68	70	1,132	594	6,310
Denbighshire and Flintshire	44	45	1,017	548	6,847
Monmouthshire and Brecon	46	46	976	512	7,870
Herefordshire	39	39	923	502	7,554
Kendal and South Westmorland	39	40	826	296	6,066
Anglesey and Caernarvonshire	52	52	690	392	6,030
Campden, Moreton & Dist. (Glos.)	31	31	665	356	7,393
Carmarthenshire	25	28	572	310	7,655
Glamorganshire	38	38	547	336	7,957
Cardiganshire	45	45	516	243	6,594
Pembrokeshire	18	18	303	185	6,823
TOTALS	4,459	4,892	140,266	71,432	7,344

* Herds of goats are not included.

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Lancashire County	113	119	3,606	1,233	7,385
Gloucestershire	108	116	3,448	1,886	7,468
Shropshire	83	85	3,247	1,706	7,653
Oxfordshire	97	102	3,142	1,720	7,428
Warwickshire	123	131	3,069	1,466	7,492
Leicestershire and Rutland	98	102	2,750	1,329	7,438
Buckinghamshire	92	101	2,491	1,176	7,531
Yorkshire	100	108	2,422	901	7,567
South Devon and District	101	105	2,277	1,038	6,818
Cambridgeshire and District	71	81	2,184	1,136	7,525
Cheshire County	56	60	2,132	968	7,799
Derby and District	61	62	2,110	911	7,974
South Wilts	35	46	2,060	1,294	7,332
Staffordshire	60	61	2,011	918	8,112
Northamptonshire	72	81	1,931	866	7,121
Cumberland and N. Westmorland	96	96	1,796	726	6,274
Bristol and North Somerset	74	79	1,742	897	7,184
Worcestershire	75	76	1,696	869	7,493
Bedfordshire	55	57	1,650	814	7,593
Nottinghamshire	47	50	1,549	650	7,664
Northumberland	60	62	1,306	727	8,110
Lincolnshire	41	45	1,292	691	7,613
East Devon	72	72	1,240	657	6,809
Durham County	41	44	1,178	497	7,955
Peak (Derby)	50	51	1,147	479	7,806
Cornwall	68	70	1,132	594	6,310
Denbighshire and Flintshire	44	45	1,017	548	6,847
Monmouthshire and Brecon	46	46	976	512	7,870
Herefordshire	39	39	923	502	7,554
Kendal and South Westmorland	39	40	826	296	6,066
Anglesey and Caernarvonshire	52	52	690	392	6,030
Campden, Moreton & Dist. (Glos.)	31	31	665	356	7,393
Carmarthenshire	25	28	572	310	7,655
Glamorganshire	38	38	547	336	7,957
Cardiganshire	45	45	516	243	6,594
Pembrokeshire	18	18	303	185	6,823
TOTALS	4,459	4,892	140,266	71,432	7,344

* Herds of goats are not included.

Cost of Milk Recording.—The average cost of milk recording per cow has varied very little for a number of years. The average cost to societies in 1929-30 was 6*s.* 3*d.* per cow, of which the member provided 4*s.* 3*d.*, the balance being made up from the Ministry's grants. The cost to the member varies in the different societies from about 3*s.* to 6*s.* per cow. These variations are mainly due to the average size of the recorded herds, as the cost of recording a small herd is much the same as that of recording a large herd.

The following memoranda, which give detailed information concerning the live stock operations of the Ministry, can be obtained (single copies free of charge) on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1 :—

Form No. 609/T.L. : Bull Grant Regulations.
Form No. 466/T.L. : Boar Grant Regulations.
Form No. 89/T.L. : Heavy Horse Regulations.
Form No. 392/T.L. : Milk Recording Regulations.

* * * * * *

MARKETING NOTES

National Mark Eggs.—In June, the output of the National Mark egg packing stations was 31 million eggs, of which 23·7 million were packed under the Mark. This latter figure represents an increase of 61 per cent. over the corresponding month of 1930.

During the period under review, arrivals of imported eggs have been very heavy. As, however, National Mark eggs have secured a much wider distribution than formerly, the demand for them has been satisfactory, even at a price of as much as 5s. per long hundred above the prices of corresponding grades of imported supplies. Many authorized packers report that they have had difficulty in obtaining sufficient eggs to fulfil their orders and supplies generally have been rapidly cleared.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during June, 1930, and June, 1931, and the number of sides graded and marked for the four weeks ended July 18, 1931, were as follows :—

		Number of sides
	LONDON	
Weekly average	June, 1930	1,991
„ „	„ 1931	1,968
Week ended	June 27, 1931	1,710
„ „	July 4, 1931	1,767
„ „	„ 11, 1931	1,511
„ „	„ 18, 1931	1,323
	BIRKENHEAD*	
Weekly average	June, 1930	178
„ „	„ 1931	23
Week ended	June 27, 1931	5
„ „	July 4, 1931	—
„ „	„ 11, 1931	—
„ „	„ 18, 1931	71
	SCOTLAND*	
Weekly average	June, 1930	2,423
„ „	„ 1931	1,111
Week ended	June 27, 1931	1,008
„ „	July, 4, 1931	934
„ „	„ 11, 1931	890
„ „	„ 18, 1931	1,000
	TOTAL LONDON SUPPLIES (All sources)	
Weekly average	June, 1930	4,592
„ „	„ 1931	3,102

*Sides consigned to London.

NOTE.—Scottish figures included Scotch sides graded and marked at Smithfield Market, London.

			Number of sides
Week ended	June 27, 1931	.. ..	2,723
,, ,,	July 4, 1931	.. ..	2,701
,, ,,	,, 11, 1931	.. ..	2,401
,, ,,	,, 18, 1931	.. ..	2,394
	BIRMINGHAM		
Weekly average	June, 1930	.. ..	137
,, ,,	,, 1931	.. ..	509
Week ended	June 27, 1931	.. ..	488
,, ,,	July 4, 1931	.. ..	455
,, ,,	,, 11, 1931	.. ..	468
,, ,,	,, 18, 1931	.. ..	456
	LEEDS		
Weekly average	June, 1931	.. ..	683
Week ended	June 27, 1931	.. ..	610
,, ,,	July 4, 1931	.. ..	554
,, ,,	,, 11, 1931	.. ..	528
,, ,,	,, 18, 1931	.. ..	552
	BRADFORD		
Weekly average	June, 1931	.. ..	424
Week ended	June 27, 1931	.. ..	343
,, ,,	July 4, 1931	.. ..	364
,, ,,	,, 11, 1931	.. ..	349
,, ,,	,, 18, 1931	.. ..	332
	HALIFAX		
Weekly average	June, 1931	.. ..	70
Week ended	June 27, 1931	.. ..	49
,, ,,	July 4, 1931	.. ..	48
,, ,,	,, 11, 1931	.. ..	47
,, ,,	,, 18, 1931	.. ..	42

The number of sides graded and marked for the London area showed a decline during the month of June, mainly owing to a number of senders of Scotch-killed beef ceasing to offer their beef for grading and marking by the official meat graders of the Department of Agriculture for Scotland. In consequence of this movement, to which reference was made in last month's JOURNAL, Scottish National Mark supplies fell off by about 40 per cent., but the number of home-killed sides graded and marked in the London area was well maintained. The situation created by the outbreak of foot-and-mouth disease at the end of June disorganized the London market to some extent, and, almost for the first time since the National Mark Scheme was instituted, wholesale prices showed violent fluctuations similar to those that were a common feature of the trade before the scheme was introduced.

The Birmingham Wholesale Market was also considerably affected by the outbreak of foot-and-mouth disease. While no change has occurred in the general position of the scheme in the Birmingham Wholesale Market, there was a marked increase during June in the number of private slaughterhouses in Birmingham at which grading and marking is carried out

at the request of the proprietors. Since January, 17 private slaughterhouses have come into the scheme, 8 of these in June.

In Leeds, Bradford and Halifax, all the gradable sides in the wholesale meat markets, and most of the gradable sides in slaughterhouses owned by the private trade, continue to be marked. The consumption of beef naturally declines in the summer months, but the figures of National Mark supplies, though slightly down, are satisfactory. For the week ended June 6, the total number of graded and marked sides was 1,149; June 13, 1,136; June 20, 1,043; and June 27, 1,002. It has been the general complaint that cattle of the best quality are hard to obtain, but this difficulty is usually experienced between the stall-fed and grass seasons. The scheme may now be regarded as firmly established in the Yorkshire area, but no increase is likely to occur in the number of sides graded and marked until grass-fed cattle are more generally ready.

National Mark " Prime " beef is specified in all the new contracts placed by the Leeds Corporation Health Committee for the supply of beef to the Corporation's Institutions.

National Mark Dressed Poultry.—Returns of output for May, 1931, have been received from the five stations operating in the scheme, showing that nearly 6,000 birds—representing approximately 50 per cent. of their total output for the month—were packed under the National Mark. These figures are encouraging, considering the high standard of quality required. Moreover, as packers, by the conditions of their authorization, are required to pack under the Mark a minimum of 25 per cent. of their output, the indication is that they find it to their advantage to use the Mark on all produce which is of the required standard of quality.

A leading firm of poultry salesmen in Smithfield Market, London, has expressed the view that the standard of grading and packing of National Mark supplies is equal to that of the highest class of imported produce.

No additions to the list of authorized packers can yet be reported, but inquiries from interested producers continue to be received.

National Mark Fruit.—*Tomatoes.*—During recent weeks, National Mark tomatoes have been well in evidence on the wholesale markets. With the generally increased supplies, prices have fallen, but National Mark fruit still realizes the top market price.

Strawberries.—Despite short crops in some districts, supplies of strawberries during the season have been fairly heavy, and National Mark consignments have arrived in appreciable quantities. In general, these have been of excellent quality and buyers have shown a marked preference for the graded fruit.

A prominent firm of Covent Garden salesmen has expressed satisfaction with National Mark supplies and stated that they could always secure 1*d.* or 2*d.* a lb. more for National Mark strawberries, which were, moreover, amongst the first consignments to be cleared.

Cherries.—National Mark cherries made their appearance towards the end of June, and heavier arrivals were expected later.

The following growers have been authorized in the National Mark Fruit Schemes subsequent to those recorded in the last month's issue of the JOURNAL.

APPLES

Hants.:	Mrs. E. A. Coltman, Burbush, Ringwood.
Kent:	Oxendale & Sons, Coombe Farm, Sutton Valence.
Worcs.:	W. H. Clarke, Rough Hill Fruit Farm, Birlingham, Pershore.

TOMATOES

Northants:	J. H. Crane, 273 Eastfield Road, Peterborough.
	D. Dandridge & Son, Nursery House, Walton, Peterborough.
Wilts.:	Burden & Sons, Mere.

STRAWBERRIES

Berks.:	University of Reading, Reading.
Bucks.:	A. Rowe, Stewkley.
Cambs.:	Cambs. Experimental Station, Rampton.
	P. Fisk, Hardcroft, Soham.
	A. E. Gautrey, Cottenham.
	H. G. Gautrey, Cottenham.
	P. &. J. Peacock, Cottenham.
Cornwall:	T. C. Matthews, Trevean, Gulval, Penzance.
Devon:	Hubbard & Son, The Nurseries, Bow.
Essex:	E. W. Chaplin, Prodys, Tiptree.
	W. Chappell, Pinecroft, Tiptree.
	G. W Free, Jacobs Farm, Haybridge, Maldon.
	R. Ward-Jackson, Wickham Bishops, Witham.
Glos.:	Overbury Orchards, Kemerton, Tewkesbury.
	R. R. Smith, Campden.
Hants.:	Mrs. A. F. Canham, Ingleby, Titchfield, Fareham.
	W. C. Chase, Park Gate, Southampton.
	Lt.-Col. C. Riddick, Hungerford, Fordingbridge.
Kent:	F. Blest, Broomscroft, Wateringbury.
	S. J. Fermor, College Farm, Ulcombe.
	C. F. Richardson, Imanwe, Round Street, Cobham, Gravesend.
	W. R. Wilthew, The Court Lodge, Egerton.
Lincs.:	F. Holland, Sutton Bridge.
	F. Thorpe, Jubilee House, Moulton Chapel, Spalding.

Norfolk :	G. C. Packard, High Kelling, Holt.
	H. C. Selby, Walpole Highway, Wisbech.
Oxford :	Capt. R. H. S. Dashwood, Duns Tew Manor.
Suffolk :	Mrs. E. E. Girling, Frostenden, Beccles.
Worcs. :	H. W. Clarke, Rough Hill Fruit Farm, Birlingham, Pershore.
	C. C. Moberley, Twyford House, Evesham.
	T. A. Tilt & Sons, Hills Farm, Hanley Castle.
Yorks. :	R. V. Roger, The Nurseries, Pickering.

CHERRIES

Berks. :	W. J. Bosley, Middle Farm, Hanwell, Didcot.
Bucks. :	A. Bayley, Orchard Bungalow, Lent Rise, Burnham.
	A. Faunce de Laune, Sharsted Court, Sittingbourne.
	Kent Farm Institute, Grove End Farm, Tunstall, Sittingbourne.
Kent :	L. J. Goodhew, 8 East Street, Sittingbourne.

National Mark Cider.—Certificates of authorization have recently been issued to the following additional approved packers, those marked with an asterisk being bottlers :—

Magna Cider Fruit and Farm Co., Ltd., Marston Magna, Somerset.
A. I. Pullin, Woodford Green Farm, Berkeley, Glos.
*John Lovibond & Sons, Ltd., Greenwich Brewery, London, S.E.10.
*Ellis & Co. (Richmond), Ltd., 11 Hill St., Richmond, Surrey.
*Paten & Co. (Peterborough), Ltd., 19 Long Causeway, Peterborough.
*Diver & Son, Ltd., 19 Long Causeway, Peterborough.
*Offiler's Brewery, Ltd., 7 Ambrose Street, Derby.

The total number of packers authorized in the scheme is now 49, consisting of 33 manufacturers and farm cider makers, 2 associations of farm cider makers and 14 bottlers. Three further applications, all from prospective bottlers, are at present under consideration. During the past two months, a large number of inquiries for information regarding the scheme have been received from bottlers, and there is reason to anticipate that, in the near future, the number of approved bottlers will be considerably increased. With the consent of the Home Secretary, the Carlisle and District State Management Scheme has decided to apply for authorization as a bottler.

Reports received from various parts of the country indicate that there is already an extensive shop display of the various brands of cider that have been brought under the National Mark. As is probably only natural, displays are, at present, most prominent in the western and south-western counties. In one town in the west, practically every licensed grocer and wine merchant has a display of National Mark cider. Elsewhere, when existing stocks have been exhausted, there will be a further expansion in the quantity of National Mark cider on sale. Authorized packers are experiencing a good demand and are satisfied with the progress being made.

In order to ensure that National Mark cider on sale is up to the standards prescribed by the Agricultural Produce (Grading and Marking) Cider Regulations, 1931, a representative number of samples has been collected by the Ministry's Inspectors; these samples are now being analysed by the Government chemist.

National Mark Canned Fruit and Vegetables.—The increase in the canning of fruit and vegetables under the National Mark continues. Extensions in the canning operations of authorized packers and the enrolment of new packers in the scheme suggest that last year's output will be at least doubled. Applications from the following packers have been approved, and several further applications are under consideration :—

Bennetts Dairies, Ltd., Manor Farm, Lower Wick.
G. H. Kisby, 27 Church Street, Maldon, Essex.
Needler's, Ltd., Bournemouth Street, Hull.
G. H. Shackleford, Box Tree, Levens, Kendal.
Yeatman & Co., Ltd., Denmark Street, London, E.1.

Among recent factory developments, the Wisbech Produce Canners, Ltd., have opened new factories at Spalding, Paddock Wood (Kent), Evesham and Dundee, and have considerably extended their premises at Wisbech. It is claimed that the machinery installed in the new factories is 90 per cent. British —an indication of the remarkable growth of canning machinery manufacture in this country. The Wisbech factory will be capable of turning out from 10 to 12 million cans a year. British Canners, Ltd., have also opened another factory at Colchester. These new factories alone employ several thousand workers. Other canners have, during the "close season," re-equipped their factories and modernized their machinery.

An adequate supply of cans for the home industry has been ensured by the erection of a large can-making factory at Worcester at a cost of £250,000. This factory, which was opened on May 27, is equipped with the latest machinery and is capable of turning out 100 million cans of all types per annum.

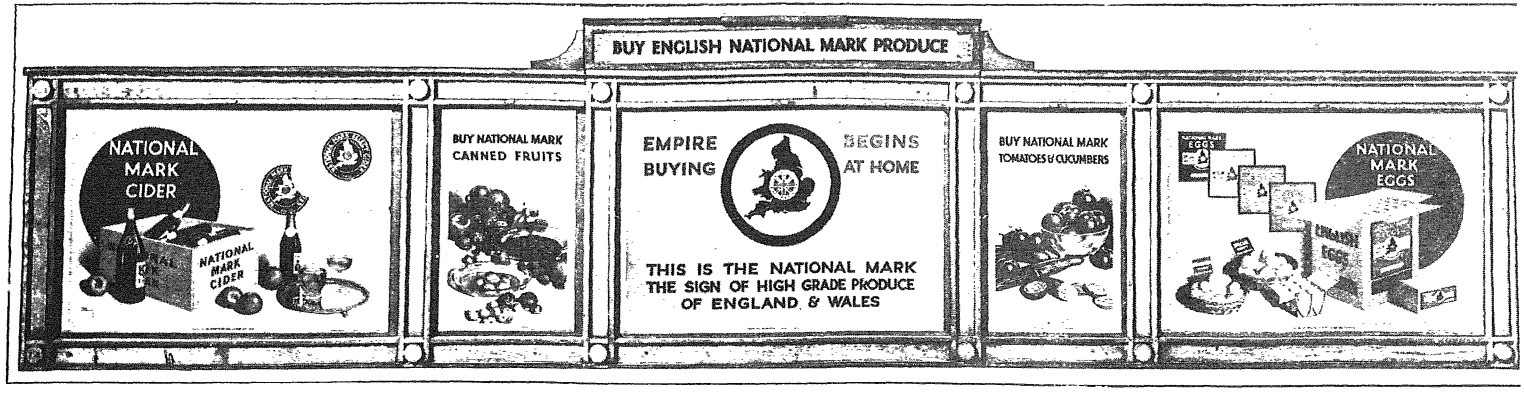
Crops of early soft fruits and peas have been good and it is expected that crops of other fruits used by the industry will be satisfactory.

Publicity for National Mark Produce.—Local publicity was undertaken in connexion with the Ministry's marketing demonstrations at the following Agricultural Shows :—

Peterborough (June 30 to July 2); Royal, Warwick (July 7 to 11); Great Yorkshire, Huddersfield (July 14 to 16); and



National Mark Wagon in the Trades Procession of the Bradford Historical Pageant (*see page* 525).



First display of National Mark Posters on the frames of the Empire Marketing Board.

Royal Welsh, Llanelly (July 22 to 24). At Peterborough, publicity took the form of press and hoarding poster advertising; at Warwick, including Leamington Spa, press and hoarding poster advertising, advertisements on omnibuses and shop window display competitions; at Huddersfield, press and hoarding-poster advertising, advertisements on omnibuses and trams, a shop window display competition, a baking competition for bread made with National Mark flour open to professional bakers in the whole of Yorkshire, a similar competition open to students of the Huddersfield Bakery School, and an essay-writing competition for school-children of the City, 5,000 of whom were given short talks on the National Mark, illustrated by films; and at Llanelly, press advertising, advertisements on omnibuses and trams, and a shop window display competition. An encouraging development at both Lincoln and Warwick was the insertion by local traders in the local papers of a number of advertisements of National Mark products. In connexion with the Historical Pageant of Bradford (July 13 to 18), a National Mark shop-window display competition was organized, and in the Trades Procession, which was one of the features of the Pageant, the City of Bradford Co-operative Society had a National Mark wagon on which National Mark eggs, flour and canned fruits were displayed. An illustration of the wagon appears facing page 524.

During July, advertisements of National Mark beef and fruit were inserted in trade journals, and the advertisements in certain women's journals were continued. Arrangements have been made for a series of advertisements to appear monthly in the *Horticulturist* and the *Hospital*, the first of which appeared in the July issues.

The first of the series of National Mark posters on the frames of the Empire Marketing Board, which have been leased by the Ministry for certain periods of the year, appeared on July 8. This poster display, which continued until July 29, directed particular attention to National Mark eggs, cider, tomatoes, cucumbers and canned fruits. The display is illustrated opposite.

In order to demonstrate the qualities of National Mark *Yeoman* flour for use in clubs, restaurants, and similar institutions, a representative of the National Bakery School was invited to conduct a practical test in the kitchens of the Ministry of Agriculture's Luncheon Club on July 4. No special apparatus or equipment was used, and the test was carried out under ordinary conditions. Batches of buns, cakes, etc., were

made by the demonstrator, and it was agreed that the results were eminently satisfactory, although the demonstrator was working in strange surroundings and with an oven with which he was not familiar.

By arrangement with the Gaumont British Film Corporation, a short talking version has been prepared of the Ministry's film illustrating the picking, grading, packing and distribution of National Mark strawberries, and is being shown in the Gaumont Sound News at a number of cinema theatres throughout the country.

Displays of National Mark and other Home Produce.—The Ministry again arranged a display of National Mark and other home produce at the Aldershot Command Horse Show, July 1 to 4; an egg-grading demonstration was carried out on the Ministry's stand by the Guildford Egg Packing Station.

The exhibition of National Mark produce at 1 Burlington Gardens, London, W.1, which, as reported in last month's issue, was opened on June 24, is attracting considerable attention. Examples of all National Mark produce are on show and a working demonstration of the grading and packing of eggs under the National Mark is being given daily. The exhibition will remain open until about the middle of August.

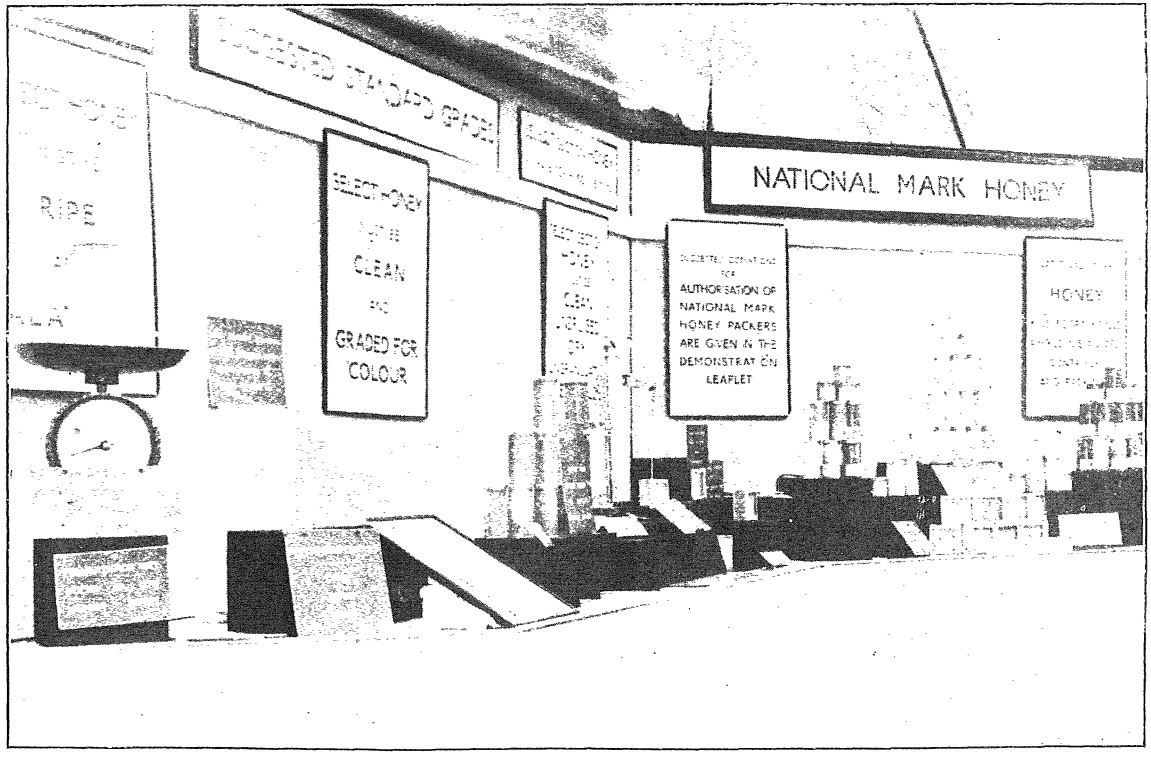
Marketing Demonstrations.—Marketing demonstrations, consisting of honey and cheese marketing demonstrations and a display of National Mark produce, were staged at the following agricultural shows during July :—

Royal Agricultural Society Show, Warwick—July 7-11.
Great Yorkshire Show, Huddersfield—July 14-16.
Royal Welsh Show, Llanelly—July 22-24.

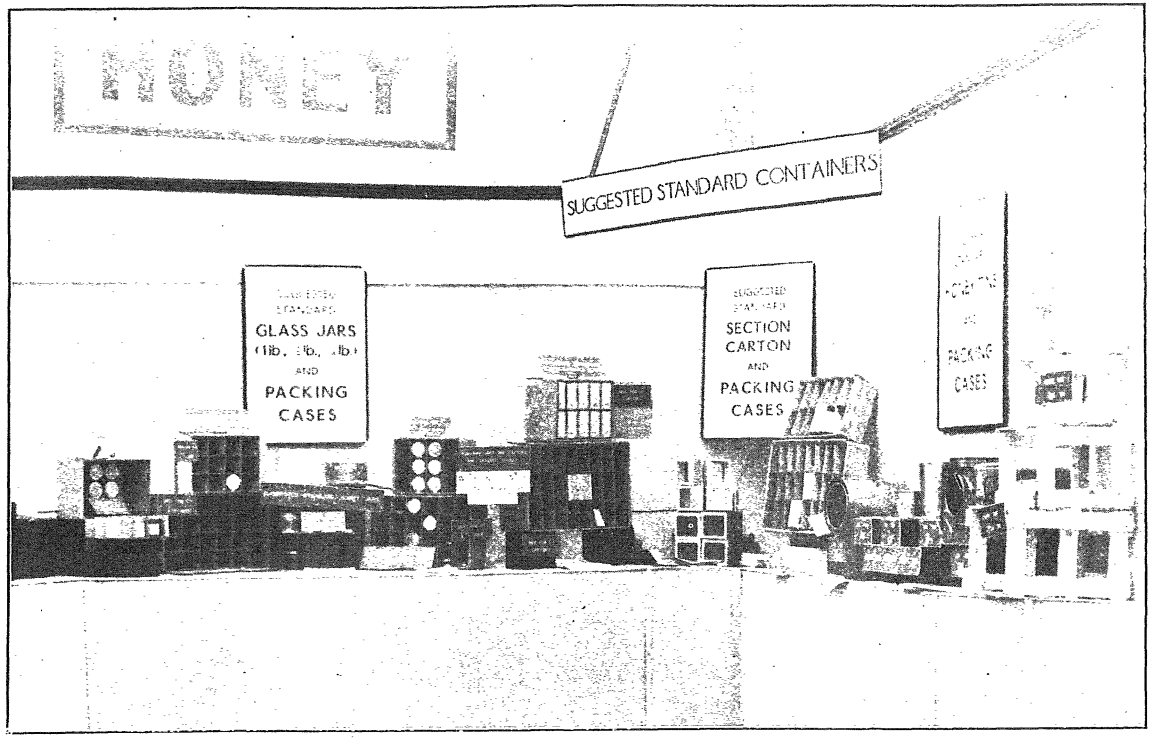
A fruit marketing demonstration was also given at the Kent Show, Canterbury, July 15 to 17.

Photographs of the honey marketing demonstration referred to above are reproduced opposite. The demonstration, which has aroused considerable interest amongst beekeepers, is designed to show the suggested scheme for the application of the National Mark to honey. As can be seen from the photographs, the first section shows the suggested grades—*Select* for extracted honey and *Select* (*Section*) for honey sections; how the specific gravity of honey is most conveniently measured; the type of cloth recommended for straining; the colour limits for light, medium and dark *Select* honey; the grade requirements as applied to *Select* (*Section*) honey, together with examples of honey conforming to the suggested grade require-

To face page 526.



First part of Honey Marketing Demonstration included in the Ministry's Pavilion at Agricultural Shows.



Second part of Honey Marketing Demonstration included in the Ministry's Pavilion at Agricultural Shows.

ments and packed in standard containers bearing the proposed National Mark labels. The rest of the demonstration consists of a display of suggested standard glass jars, section cartons, packages and tins.

This demonstration will also be given at the National Show of Bees and Honey, Crystal Palace, September 9 to 12, and at the Dairy Show, Agricultural Hall, Islington, N.1, October 21 to 23.

South Africa : Grain Pool.—The recent formation of the South African Central Co-operative Wheat Pool, Ltd., is an outcome of the efforts being made by the cereal growers to place the organization of the wheat industry on a better footing. The principal object of the new organization is to stabilize the price of grain by supplying the market evenly through one selling channel and thus prevent the competition in selling that has previously existed between the local wheat co-operative societies. Membership of the organization is limited in the Union to registered co-operative agricultural societies and companies, and, in the adjoining British Colonies and Protectorates, to companies that have been approved by the Minister of Agriculture. The Board of the Pool is empowered either itself to sell all grain received from members or to control the sale by other agencies. Grain held and sold by the Pool itself may be sold either as a whole according to variety and grade, or in separate lots, as received from its member-societies. Payment to members for all grain pooled and sold by the Board itself is made at the average price obtained, for each variety and grade of corn, during the course of the pooled account, less a commission not exceeding 1½ per cent. to cover administrative expenses. Payment for grain sold in separate lots to the account of members is made at the actual prices obtained, less administrative expenses. The Company's operations cover wheat, barley, oats, rye and other grain.

Canada : Grading and Marking of Honey.—New Regulations for the voluntary grading and marking of honey offered for sale in Canada were made on May 15, 1931. In these Regulations, four colour classes are defined, namely: Class I, White; Class 2, Golden; Class 3, Amber; and Class 4, Dark; and three quality grades: Grade A, Fancy; Grade B, Choice; and Grade C, Manufacturers. All honey offered for sale in accordance with these standards must be in new containers marked in the prescribed manner.

Provision is made for an Inspection Service, by Government Inspectors with powers to enter premises where honey is being graded and marked, to ensure compliance with the Regulations.

It is also laid down in the Regulations that imported honey shall be marked with the name of the country of origin.

Bulgarian Standardization Act.—The enabling Act that recently came into force in Bulgaria for the standardization of agricultural products for export provides for the establishing of an Export Institute. This Institute, which is situated in Sofia and is subordinate to the Ministry for Trade, Industry and Labour, is charged, *inter alia,* with the following tasks :—

(1) To study the markets in other countries for Bulgarian products.
(2) To study production and economic conditions in those countries.
(3) To issue results of these studies to the parties interested.
(4) To influence Bulgarian agriculture to adapt its production to the needs of foreign markets.
(5) To issue recommendations for the organization of the Bulgarian export trade ; to give support to the formation of organizations and of central offices for the export of Bulgarian products.
(6) To exercise control over the quality, standardization, uniformity and methods of packing and dispatch of Bulgarian products ; to set up a Bulgarian national export mark and exercise control over its application.
(7) To carry on publicity for Bulgarian products in foreign fairs and exhibitions.
(8) To give expert advice on (*a*) bills and regulations affecting the export trade ; (*b*) customs duties and railway tariffs ; (*c*) commercial treaties.
(9) To advise the Bulgarian Government on all questions concerning the export of Bulgarian products.

The Institute is *not* authorized itself to engage in trade.

The constitution of the Export Institute is as follows :—

(1) *Board of Directors,* which consists of the President, Vice-President and General Secretary, the representatives of the Ministries of Trade and Agriculture, of the State Banks and Chambers of Commerce, of the Exchanges and of the Co-operatives, etc. Either the Minister of Trade or the President acts as Chairman.
(2) *Branches,* the number and constitution of which are determined by the Minister or the Board of Directors.
(3) *Management and Office Staff.*
(4) *Foreign Trade Representatives* of the Institute.

The Institute is financed by State funds, by subsidies from the Chambers of Trade and the Exchanges, but for the most part by the proceeds of levies that may be imposed in return for the right to use the national mark.

The chief task of the Export Institute is to set up a Bulgarian national mark for agricultural products. The right

to use the mark is granted only to firms entered in the Bulgarian Trade Register, after payment of a levy that varies from 200 to 5,000 lewa according to the kind of product and the size of the firm.

The work of supervision is done by the Inspectors of the Export Institute. The Mark products—eggs, grapes and other fruit will probably be the first to be dealt with—are inspected for their quality and packing before export. A notable provision is that the control may be exercised not only at the border but everywhere both at home and *abroad*. Infringements of the standardization regulations are punishable by heavy fines (from 5 to 10,000 lewa).

The Need for Standardization in Germany.*—If economic problems could be solved by discussions, speeches and Press articles, the standardization of agricultural products in Germany would long ago have become an accomplished fact. Unfortunately, however, they cannot; indeed, prolonged and frequently passionate discussion of the meaning, technique and possible results of standardization has transferred this set of eminently practical problems out of the sphere of practical policy into that of academic dispute and technical literature. Meanwhile, other countries have been standardizing (most of them for more than a decade†) and have forged keen weapons for commercial warfare in the shape of operative laws. With their standardized goods, these countries are now intensifying their onslaught upon German markets. Danish, Dutch, Lithuanian, Finnish and New Zealand butter; cheese from Switzerland, Holland, France and Finland; poultry from Soviet Russia, Poland and Jugo-Slavia; eggs from Denmark, Holland, the United States (!) and South Africa; apples from Canada, the United States, New Zealand and Soviet Russia; pears, peaches and greengages from South Africa, California and tropical islands; tomatoes from Teneriffe, Tunis, Egypt, Italy, Spain and the South of France; standardized wheat and maize; standardized preserves and innumerable kinds of vegetables—these are examples of the fully standardized products that are now obtainable in every German market, irrespective of "season."

* From an article by Dr. Karl Brandt. (Blätter für Landwirtschaftliche Marktforschung, Berlin. April, 1931.)

† Grain has been standardized for half a century and cotton for more than a century.

These facts raise two questions :—

(1) What benefits does standardization confer upon agriculture ?

(2) Why does standardization make so little progress in Germany ?

(1) One of the commonest answers to the first question given by those who oppose standardization is that it is of value only for exported produce and that in consequence only countries exporting produce on a large scale are interested in the principle. In this view there is a grain of truth. It is true that the benefits of standardization are most striking where produce is consigned to distant markets. On the other hand, to limit the value of standardization to the export trade is completely to misunderstand the full implications of the word. Standardization—that is, the creation of uniform standards—eliminates the confusion of terms that at present makes it impossible on the German market for merchants or producers in different places to agree about what is meant by "*good* cabbage," "*good* rye," "*good* butter," "*good* apples," "*first-class*," "*good*," or "*medium quality*" Tilsiter cheese ; or, to take the example of milk, a product in which the various qualities are still undefined, what is meant by best, medium, and poor milk for human consumption. The reason there is confusion is that a primitive and crude standard such as that denoted by the simple word "good" cannot measure the extraordinarily complicated and finely graduated range of qualities met with in a given product. For this purpose, a comprehensive set of measuring instruments is required in the form of "standards" and "grades." A notable example of the kind of comprehensive grading scale, covering all possible kinds and differences of quality, is provided by the Russian standards for dressed poultry.

In any country, the first step in the direction of standardization, after thorough investigation of the facts, must be for those concerned to agree upon uniform quality standards for different products. The standards agreed must then be given statutory effect throughout the country. Then, and only then, can a general advance be made in adapting the quality of produce to market demands.

If prices are quoted and produce described according to the same quality designations throughout the whole country, the producer in the long run learns what quality of produce fetches the highest price. The higher price received for quality will act as a telling argument and as a stimulus to individual growers in the direction of producing high quality goods. By rewarding individual growers according to the results attained by them, standardization alone can bring about the improvement in the quality of German agricultural products that is so essential.

The classification of a product according to fixed and clearly defined grades—in other words the creation of a standard article, each unit of which is interchangeable with any other of the same grade—is obviously of great value, both to individuals and to the nation as a whole. It reduces to a minimum the tremendous waste of energy that is involved in the dispatch and transport of ungraded produce. Both dirt and useless, inedible and spoilt goods remain at the point of production or packing. One source of considerable risk to the merchant in buying is thus eliminated ; he does not have to pay for waste material at the same rate as good produce. The factor of uncertainty, which makes the trade in some products (*e.g.*, hay, potatoes, cabbages) so risky that co-operatives find it best to keep clear of it, while the merchants say that the risks are about as great as in horse-dealing, is removed.

Strict requirements in respect of packing should accompany grading. Every standardized product should have a good standardized design of package that is economical in storage, and, where possible, is non-returnable.

There is no doubt that where sorting, grading and orderly packing are carried out, costs are higher than where products are consigned ungraded. Since the introduction of standardization, it has been a matter of debate whether this increased outlay can be recouped where goods are consigned to local markets. Practical considerations, however, show that this question is beside the point. Standardized foreign products actually sell more readily in German markets, even at higher prices, than ungraded German produce; owing to their reliability, they are in constant demand and either oust the much cheaper ungraded produce from the market, or depress its price to an unprofitable level. This being the case, two alternatives remain—either to standardize as well, or to be slowly but surely driven from the market. Quite apart from the question of foreign competition, however, a practical, businesslike examination of individual instances shows that there are other reasons why standardization is desirable. Thus, ungraded produce, being an unknown quantity, of uncertain supply, has no assured and constant outlet, and can be ousted from one day to another by any competing product that comes along. Standard produce, on the other hand, can obtain a firm hold on the market. Then, again, publicity can be undertaken only for standard products. On the general question, it may be said that the higher prices obtained for standardized produce usually cover the increased grading and packing costs.

It is true that to achieve these results certain psychological conditions must be fulfilled. The customer must have some knowledge of the product, and confidence in the standard product must be gained gradually. To win his confidence, the product must not appear only at uncertain intervals and then disappear from the market altogether; supplies must be as regular as possible. The importance of this point is frequently under-estimated in agricultural circles. German tomatoes first won a firm place upon the market when the season for tomatoes had been extended by combining various foreign supplies with home-grown, so that the housewife could count on being able to buy tomatoes at almost any time of the year. The reason why German cantaloup-growing makes little progress is that, so far, no adequate combination has been effected with the various foreign supplies to ensure deliveries of cantaloups and other finer sorts of melon at reasonable prices over a season of 6-8 months. With standard products, on the other hand, purchasers have a real chance of forming consumption habits and developing a sound judgment with regard to them.

(2) It is far more difficult to answer the second question—why standardization makes so little progress in Germany. The true solution is that Germans, with their proverbial and frequently excessive thoroughness, have so elaborated the difficulties and subtleties of what is really a perfectly simple matter that practical men, from whose ranks the pioneers of standardization must necessarily be drawn, have acquired a horror of it equal to the layman's horror of mathematical formulæ. The experience of Germans travelling abroad, as representatives of the distributive trades, of the co-operative movement and, recently, of the Government as well, has been universally the same—that standardization, which through prolonged discussion and theorizing has been relegated in Germany to the province of "agricultural alchemy," has been found, when put into practice in other countries, a simple matter of trade routine. It has required little administrative machinery, and a few well-thought-out laws

have been able to ensure the general application of standardization systems and to prevent abuses and evasions.

For example, how did Latvia effect the remarkable expansion that has taken place in her exports of high-grade butter—from 200 cwt. in 1921 to 368,000 cwt. in 1930—and at the same time secure a place for it among the highest quality butter on the world market? Simply by the following straightforward measures: by statute, all butter for export must pass through a State-controlled cold-store at Riga and must come up to certain statutory minimum quality requirements. The interest and amortization on the cold-store are paid out of the proceeds of storage charges. Attached to the cold-store there is a laboratory controlled by the Ministry of Agriculture, with a staff of dairy instructors of absolute integrity. This central control station, co-operating on friendly terms with the 700 dairies in the country, very soon began a process of steady, almost daily, improvement in the quality of Latvian butter.

How did Holland develop the standardization of her cheese to such a degree? On every market in the world, the uniformity of its quality is recognized; nowhere is it a drag on the market. In addition, the place and date of manufacture of every single cheese can be exactly determined. These results were attained by establishing by statute a State inspection service and a system of marking all cheese with a State mark under the supervision of this service.

In all countries where standardization is being undertaken, the decisive factors in the success of standardization schemes are State supervision and the friendly assistance and encouragement of State Inspectors.

In conclusion, it is true to say that in the whole sphere of agricultural policy, nothing is more urgent than effective, straightforward standardization of all important products.

Norway: Marketing of Bacon, Eggs and Milk.—References have previously been made in these Marketing Notes (see issues of the JOURNAL for April, 1931, pp. 75-6, and June, 1931, pp. 296-7) to the Marketing Council set up in Norway to improve the methods of marketing bacon, milk, cheese and butter. This Council is at present financed by a levy imposed on all milk delivered by producers to a dairy, cheese factory, milk-condensing factory or other business selling milk or milk products, and also by a levy on pig carcasses. In the original Act under which the Marketing Council was established, no provision was made for a levy on milk sold direct from the producer to the consumer. It has been ascertained, however, that a levy on this class of producer could be collected without difficulty, and a Bill to authorize this levy is accordingly being introduced. The same Bill also contains provisions for eggs to be included in the marketing scheme. If the Bill becomes law, regulations for the imposition of a levy on all eggs sold by producers will be made as soon as a satisfactory and practical method for the collection of the levy has been drawn up by the Marketing Council.

The new organization of bacon producers (*i.e.*, bacon curers and pig farmers), known as "Norges Fleskecentral," has now been constituted with a membership of 74,000 producers. It is anticipated that when all applications for membership have been dealt with, the organization will eventually have 90,000 members. This organization has been set up to stimulate the production and consumption of bacon and to control the home market by exporting and, if necessary, preserving any surplus that may occur. It will nominate one member to the Marketing Council and will be responsible for the collection of the levy on pig carcasses.

Norway : State Grain Monopoly.—The Norwegian Cabinet have decided to introduce a bill authorizing the State Grain Monopoly, in view of the heavy fall in grain prices, to increase the bonus granted in certain circumstances to native growers. The increase is estimated to entail an additional expenditure on the part of the Monopoly of about two million kroner (about £100,000) per annum, for which it will have to recoup itself from the consumer.

National Mark for Belgian Eggs.—To supplement the law with regard to the import, export and transit of eggs in Belgium and the Order establishing an export control for Belgian eggs, the Ministry of Agriculture in Brussels has issued a further Order (*Moniteur Belge*, No. 349) instituting a National Mark for Belgian eggs.

The Mark consists of the Belgian lion set in a square of 8 x 8 cm. On one side of the lion is printed the word "Belgique" and on the other "Belgie," and underneath, the words "Contrôle des Œufs," "Eiren Controle."

The Ministry of Agriculture issues to registered exporters labels printed with the National Mark and bearing a serial control number. The Mark labels, which may be used only by these firms and only for fresh Belgian eggs ("Œufs belges frais)", must be attached to the top of the boxes. Next to the Mark label must be indicated the number under which the export firm is entered in the Ministry's Control Register.

National Mark for Portuguese Fruit.—It is understood that the Portuguese Government proposes to institute a National Mark Scheme intended to improve the quality and stimulate the production of green and dried fruits grown for export. Lack of uniformity, variation in size, irregular quality and

bad presentation of fruits for export are considered to be responsible for the present restricted market for Portuguese products.

A National Fruit Exportation Committee (Junta Nacional de Exportação de Frutas) is to be formed, whose business it will be to authorize, regulate and control the use of the Mark. The Committee will determine the products to which the Mark may be applied and the weights, marks, qualities and processes for conditioning of such products. The proposed National Mark will be that of a silhouette map of Portugal in which will be a design similar to the Portuguese Shield, bearing the words "Frutas de Portugal."

Only firms and individuals authorized by the Committee will be permitted to apply the Mark, and various conditions will be imposed as to the grading of the fruit and its freedom from disease. Provision for the inspection of orchards, factories or warehouses is to be included in the scheme, which will also regulate methods of packing, wrapping of the fruits, etc.

Switzerland: A National Mark for Agricultural Raw Materials.—The Agricultural Division of the Swiss Federal Department of Public Economy has introduced a scheme for the supervision of the trade in fertilizers, feeding stuffs, insecticides, seeds and other agricultural raw materials, on the part of various Swiss associations and firms that have agreed to submit to official control.

A National Mark for application to packages by the controlled firms has been registered by the Agricultural Division of Public Economy. The controlled firms undertake to furnish guarantees regarding the genuineness and purity of all goods placed on sale, and, where required, the percentage of approved components.

The Regulations prescribe the conditions under which the Mark may be affixed to packages, but the Mark may not, as yet, be reproduced on firms' trade stationery.

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CONCENTRATED WHEY FOR GROWING LIVE STOCK

LEONARD HARDING, Ph.D. (Cantab.), M.I.Chem.E.

THE unique value of dairy by-products in the nutrition of the animal organism is so well known that it may not be necessary to emphasize it. Whether it be in the feeding of children or farm animals of all kinds, the same subtle influence is observed when the ration includes a small proportion of milk or a milk product. One of the notable features of this subject is that this subtle influence is observable whether the product fed is whole or skim milk or whey. It may be added that when concentrated whey has been fed with cereals to farm animals it has had highly satisfactory effects on growth and health. Fresh whey gives similar results, but owing to the high percentage of water it contains it is not possible to utilize the same amount of whey solids as when a concentrated product is employed. The effects referred to have been so frequently confirmed by feeding experiments that there can be no question that the substances in milk that have such a potent influence on nutrition are, at any rate in part, carried forward in the milk serum or whey.

It may be suggested that as whey is deficient in protein as compared with milk, it cannot be as good a food. It may be submitted, however, that one should not buy dairy by-products simply as a source of protein, carbohydrates or fat. A high price is paid for milk products because, besides containing valuable digestible constituents, they have a peculiar effect on nutrition. This special nutritive effect is also found in whey, and it is suggested that it is more economical to buy concentrated whey foods than an equivalent weight of any other mixture of milk solids. There is evidence that the substances left in whey are probably those very substances that gave the original milk its peculiar nutritive value. These substances cannot be substituted by others of different origin.

It is natural to consider which of the main constituents in whey, if any, is responsible for the well-known influence on nutrition. Is it one particular substance, or are the several constituents jointly responsible? Whilst it is impossible to answer this question, it is worth noting that the main constituent, viz., lactose, is a peculiar sugar with very different properties from any other sugar. For example, it is only utilized by the animal organism after it has reached the intestine. Here it is split up into dextrose and galactose by

the lactase which is present in the intestines of mammals. The mono-saccharide, galactose, is of undoubted importance in nutrition, feeding, as it does, the nervous system, spinal cord and brain. It should be remembered that infants must have sufficient of this sugar in order to thrive, and that is why the human mother's milk is so much richer in this sugar than is the milk of any other mammal.

Now lactose has many functions, one of the most important being its effect in maintaining the right type of intestinal flora. The feeding of lactose helps to maintain a fermentative type of digestion and thus tends to prevent putrefaction of food, which is the cause of many diseases. Thus the lactose may be responsible for the main effect of dairy products on nutrition, but it must also be noted that concentrated whey foods are also rich in lact-albumin—the most digestible albumin known—and milk minerals. These milk minerals are mainly compounds of calcium and phosphorus in a form which makes them easy of assimilation. There is no doubt that these minerals have a greater effect on the general health and growth than artificial minerals added to the ration, for they are in the combination in which Nature intended them for utilization by the young. In this connexion it should be noted that Dr. Robertson observed that pigs lose condition if artificial minerals are fed when dairy products also form part of the ration. Therefore in feeding concentrated whey products, it is important to see that too much artificial mineral is not used. The same remark applies to the feeding of poultry, otherwise there will be scouring.

Whilst the above comments on the effects of whey ingredients might be regarded as speculative, there is ample proof from recorded experiments that milk solids are of special importance in nutrition, and it would therefore appear that the feeding of small quantities of concentrated whey foods should be specially encouraged. This is more economical than to feed dried or concentrated milk, and certainly more economical than not to feed a dairy product as part of the ration.

The Ministry of Agriculture and the Royal Agricultural Society have in the past been very concerned about the waste of whey in Great Britain, and they have been responsible for research work which has resulted in processes being established which have made it possible for farmers to get concentrated whey foods all the year round. These foods are now in extensive use both here and in New Zealand, where the same processes have been established. It is, therefore, important

that farmers should become more acquainted with the experience that has been obtained on the value and availability of these products.

It is first of interest to note that the processes referred to are of such a nature that the ingredients in the whey are as far as possible left in their normal condition, only the water being removed. As a consequence of the low temperature at which the water is evaporated, the products are still rich in vitamins, especially Vitamin D. This fact has been determined in the biological laboratories of the Pharmaceutical Society. In purchasing whey foods, therefore, one not only gets the actual value of the known food ingredients and the subtle influence on nutrition, but the antirachitic properties which are present in the fresh products.

The foods now available are of three kinds, namely, whey paste, concentrated whey and dried whey powder. They are all in use for the feeding of pigs, poultry and calves, the powder being particularly valuable for mixing with a dry mash. All the foods are rich in lact-albumin, lactose (sugar of milk), milk salts and lactic acid.

They have now been extensively fed for some years and a considerable amount of experience has been gained in their use. In all cases it has been found that these concentrated foods have been effective in maintaining health and exceptional growth, and have proved economical to use. A few years ago, the Ministry of Agriculture reported the results of feeding experiments with concentrated whey and brewers' grains, when it was shown that this mixture, called "lactose food," had the same value as bean meal. It was thus demonstrated that a poor foodstuff can be made into a good one by the use of whey solids. This is of great economic importance, for it becomes possible to use foodstuffs which could not otherwise be effectively utilized. Since these trials, similar observations have been made in New Zealand, where extended feeding tests are being and have been carried out with whey paste in the feeding of pigs, calves and poultry. Results obtained there have shown that whey paste has 200 per cent. the value which would be calculated from its starch equivalent, thus bearing out the observations of other workers in different fields. Calves are now being regularly brought up on whey paste in New Zealand, and it is estimated by those farmers who are using the product that they save £2 per calf on the milk formerly consumed.

In this country, reports are regularly received of valuable

results following the use of concentrated whey foods. Several poultry feeders have observed most extraordinary results on fertility which may be due to improved health or other causes. A recent report from a private experimenter states that, in the case of pigs, the feeding period has been reduced from four to six weeks, and that the immediate effect of feeding concentrated whey was to give a lusty and vigorous appearance to the animals and a milky texture in the flesh as in baby beef. The same experimenter also noticed a great increase in milk in a brood sow. His conclusion is that "concentrated whey is the greatest contribution that science has yet given us to lower cost of production in pig feeding."

There is no doubt that the results ought to be seriously considered by all farmers. It is interesting to note that, at recent shows, many prizes were won for pigs which had been receiving concentrated whey products as part of the rations. One very useful feature of these foods is that they enable a feeder to maintain the same number of pigs the whole year round. It is well known that pigs that have received fresh whey during the cheese-making season go off immediately the whey ceases, and no matter how they are fed they never seem to come on fast enough. Now that concentrated whey products are available, it is possible to prevent this falling off and maintain an economical number of pigs throughout the year.

These few observations indicate that the use of concentrated whey foods is useful from many points of view, but particularly for the maintenance of health, for quick fattening and for the production of good flesh. It should also be remembered that these whey foods are British products, and that the development of this industry will finally improve the value of manufacturing milk.

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NOTES ON PRICES AND SUPPLIES

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THE end of the season for English wheat showed the small quantities on offer fetching rather more money, though wheat prices generally were weaker, and the new crop when it comes on the market is likely to start at a lower level. The restrictions consequent on the outbreak of foot-and-mouth disease had a temporary effect on the prices of fat stock, but values in the middle of July were slightly lower than a month earlier. The seasonal tendency is now downwards into the autumn. Sheep and lambs have weakened somewhat and rates are about 2*d.* per lb. dead weight below those ruling in July last year. Large supplies are due on the market both from home sources and from Ireland. Pigs are several shillings per score lower than last year, and though porkers will no doubt recover to some extent in the autumn, the prospect of materially better prices for bacon pigs seems to depend on more moderate supplies of bacon from the Continent. New cheese, both English Cheddar and Canadian, is realizing much lower prices than were obtained at the beginning of the season last year, the decline ranging from 15 to 25 per cent. Cheshire is in a stronger position, and only shows a drop of about 7 per cent. Eggs are now moving upwards, though rates are less than at this season last year. Growers of first early potatoes have been benefiting by good prices. Wool at country sales showed a drop, averaging about 4*d.* per lb., compared with last year.

Some comparative prices ruling a month ago and a year ago are shown in the table overleaf.

On the whole, the price situation does not afford much ground for optimism. Every commodity, except potatoes, continues to be on a lower level than last year, and there seems little prospect at the moment that values generally in the ensuing twelve months will be above those ruling in 1930-31. Agriculture, however, is suffering specially from an oversupply in relation to the normal demand; and more moderate receipts from abroad would have a beneficial influence. In the case of wheat no relief seems in sight at present, but some of the other commodities, such as butter, bacon, frozen lamb and cheese, of which large quantities have been put on our market from abroad, are subject to seasonal influences and there is a possibility of reduced imports. The present unattractive

	Prices in the middle of					
	July 1931		*June* 1931		*July* 1930	
	s.	d.	s.	d.	s.	d.
Wheat, Gazette average, per cwt. ..	6	4	5	11	8	3
Fat cattle, 1st quality, per cwt.	51	0	51	4	52	4
Beef, English N.M. Prime, per lb. ..		8¾		8¼		9¼
Beef, Argentine, chilled H.Q., per lb. ..		6½		7		8
Fat sheep, 1st quality, per lb.		11½	1	0	1	1¾
Mutton, English, per lb.	1	0	1	0	1	0¾
Lamb, New Zealand, per lb.		8		8½		9¾
Bacon pigs, 1st quality, per score ..	11	3	11	5	15	1
Bacon, Danish green, per cwt.	70	0	58	0	98	0
Pork pigs, 1st quality, per score ..	12	5	12	10	16	8
Pork, English, per lb.		7½		7¾		10¼
Cheese, English Cheddar (new), per cwt.	72	6	—		90	0
Cheese, New Zealand, per cwt.	64	6	59	6	82	6
Eggs, N.M. Standard, per 120	14	9	10	6	16	0
Wool, Southdown, per lb. (at Bradford)		10½		10¾	1	3
Maize, Argentine, per cwt.	4	1	4	2	7	3

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending July 15, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

prices should, moreover, tend to a restriction of output, but the low price level of all agricultural commodities and the lessening of demand elsewhere does not give producers in foreign countries much choice of alternatives and tends to increase the pressure on the British market.

Wheat.—Crop news regarding countries in the northern hemisphere is now assuming a more definite shape, and it begins to be possible to get a general view of some of the factors that are likely to rule the market in the ensuing twelve months. In Europe, harvest prospects appear to be generally favourable, and preliminary estimates indicate that the production of several important countries will exceed that of 1930. In Germany, the area under wheat is 5,335,000 acres, against 4,400,000 acres last year, and the condition of the crop is reported as above average. The yield is officially estimated at 21 million quarters as against 17 million quarters last year. In France, the area has been reduced by 500,000 acres, but the condition of the crop is good and an unofficial estimate gives the probable yield as 34,500,000 quarters, compared with 28,900,000 quarters in 1930, when the harvest was much below the average. In Italy, a crop larger than last year is expected. In Great Britain, estimates of probable yield will not be available till August, when the area planted is known, but the total crop may well exceed the poor results obtained last year. On the whole, present indications are

that the requirements of the importing countries in Europe will be reduced. In addition to the smaller demand due to a better harvest, the quota system has just been brought into operation in Italy and Holland, and in France the percentage of foreign wheat to be used by millers has been reduced to 15 per cent. as compared with 30 per cent. which was allowed in June.

The total shipments to Europe in the season just ending will probably amount to 75 or 76 million quarters and are obviously likely to be less in the coming season, the reduction being provisionally estimated by the *Corn Trade News* at 10 million quarters. Assuming that the demand by non-European countries is unchanged, the exporting countries would thus only be called on to supply about 88 million quarters as compared with 98 million quarters this season.

To meet this demand supplies are more than ample. The drought in Canada has been very severe and the condition of the spring crop at the beginning of July was only 56 per cent. of the 10-year average. There are, however, still large reserves from last year's crop that will admit of a substantial export in the coming year. In the United States the total crop is estimated as rather over that of last year. Here again there are large reserves, chiefly in the hands of the Farm Board, amounting, it is believed, to about 250 millions bushels. In Russia, the total area sown seems to be about 94 million acres as against 86 million acres last year. It is too early to foresee the probable yield, but a large export must be anticipated. In the southern hemisphere, a reduction in acreage has apparently taken place in Australia and Argentina, and the surplus is likely to be less than this season. The crops in these countries are not, however, harvested till December, and will not begin to influence the market materially for some little time yet. For the present, the operative factors are a poor demand on the one hand and excessive supplies on the other.

The course of prices in the near future will necessarily be affected by the manner in which grain is offered for sale, and a favourable circumstance is that a substantial portion of the excess supply immediately available is in the hands of the Federal Farm Board, which is likely in the interest of American farmers to make every effort to avoid depressing the market. There is a strong demand in the United States that the Farm Board should hold its supplies off the market until prices reached a level of, say, 80 cents a bushel, as against a current price of about 54 cents, that is to say,

that the Farm Board should not compete with the new crop now moving to market. This request has not been acceded to, but the Farm Board has indicated that it will limit its sales of wheat up to July, 1932, to a cumulative maximum of 5 million bushels per month (excluding sales pending in July, 1931) and that it is not proposed "to make any immediate sales even of these limited amounts at the present range of prices." It will be seen that the effect of the Board's declaration is to restrict exports of wheat from the United States in the coming cereal year to 60 million bushels, plus such quantities as may be sold in the ordinary course of business from the 1931 crop or from stocks in private hands. This should in due course have a firming influence on prices, though it will still leave a large unsold stock in the hands of the Farm Board to be carried forward to the 1932-33 season.

Another circumstance that may indirectly have a beneficial effect is the proposed setting up of an International Wheat Information Service as an outcome of the Conference of Wheat Exporting countries held in London in May last. This Service is intended among other objects "to foster collaboration between wheat exporting countries with a view to encouraging the effective distribution of wheat and to facilitating the better understanding of the wheat problem." Another purpose is "to promote, by investigation and education, the greater consumption and utilization of wheat and wheat products." It is understood that all the wheat-exporting countries, including Russia, will participate in the organization of this Service, which, although it cannot actually regulate the supply of wheat to market, may have a valuable advisory influence.

Current world wheat prices continue to decline. In the middle of May, the Liverpool July wheat future was 4*s.* 7½*d.* per 100 lb.; a month later it was 4*s.* 3½*d.*, while in the middle of July it was down to 3*s.* 10¼*d.* The October future was slightly better at 4*s.* 1⅜*d.* This downward tendency is the more striking in view of the reduction in the Canadian crop. In ordinary circumstances such an occurrence would have had a distinctly firming effect on prices, but this year the effect has been counteracted by a general disinclination to purchase consequent on the uncertainty of the outlook.

Cattle and Beef.—Owing to the outbreak of foot-and-mouth disease, the number of fat cattle shown at representative markets decreased, the total for 3 weeks following the outbreak being 16,700 as compared with 24,000 last year. Buying by private treaty met the deficiency, while the imports from

Ireland were, to some extent, replaced by Canadian cattle that have recently been landed in increasing numbers, the total received in June being 3,200.

The best average price realized this season was reached in the week following the outbreak, when first-quality fat cattle touched 51*s.* 9*d.* per live cwt., but the improvement was not maintained, and prices gradually fell back to the level ruling in June. National Mark prime beef also rose and, for several weeks up to the middle of July, was better than at any time since August last. Chilled beef from the River Plate continued in moderate supply, but prices were about 1½*d.* per lb. cheaper than last year. In this connexion it is interesting to note that the Argentine Government has recently been showing concern at the low rates realized for cattle in that country. In May the Minister of Agriculture met the Meat Companies in Argentina and pressed them to improve the prices they were paying for cattle, alleging that present prices were ruinous to producers. He asked that a price of 30 cents per kilo live weight should be paid, and that a more liberal classification of cattle should be adopted when buying. Some provisional agreement seems to have been reached on the basis of 29 cents per kilo for the best grade of fat cattle, which apparently is a figure higher than would be paid in an entirely free market. While this may not have any reaction on the English price for chilled beef, it suggests that the supply of cattle available for the killing and freezing industry in Argentina is in excess of requirements.

Store stock prices in June averaged £15 11*s.* 0*d.* per head as against £15 12*s.* 0*d.* in the same month last year. The supply has probably been on the short side, as the numbers imported from Ireland this year up to the date of the recent prohibition only amounted to 192,000 as against 233,000 last year, a drop of 17½ per cent. The need for re-stocking after an outbreak of disease has on past occasions affected the price of dairy cows, and—as pointed out last month—demand and consequently prices usually tend upwards from July to about November.

Sheep and Lambs.—Owing to the suspension of the traffic from Ireland, the importation of fat lambs this season up to the middle of July amounted to only 129,000 head as compared with about 200,000 head in the same period last year, but the reduction in supply seems to have had little effect on prices, which continued to ease, first quality Downs and

Crossbreds averaging 11½*d.* per lb. and lambs 14¼*d.* per lb. dressed carcass weight.

Imports of frozen lamb from New Zealand, Australia and River Plate are now reduced, and prices are fairly maintained. The total killings of lamb in New Zealand in the season to the end of June numbered 7,593,000—an increase of 818,000 or about 12 per cent. Practically the whole of the increase has already been landed in the United Kingdom, and there was less lamb than last year remaining to be shipped.

Pigs, Pork and Bacon.—Although there was a slight temporary improvement in fat pig prices, consequent on the disturbance to trade caused by the disease regulations, prices subsequently declined in sympathy with the low values realized for pork and bacon. Pork in London at the beginning of July was only realizing 7½*d.* per lb. as against 10¼*d.* last year, while Danish bacon, though above the lowest, stood at 70*s.* per cwt., or about 30 per cent. less than in 1930.

The total imports of bacon in June were again exceptionally high, 974,000 cwt. being landed as compared with 744,000 cwt. in June, 1930, the total for the six months amounting to 5,402,000 cwt., or 27 per cent. over the total of 4,251,000 cwt. received in the same period last year.

Mention was made in these notes in May last of the fact that in Denmark the number of breeding sows showed a small decline, which suggested a slowing up in the very rapid increase in pig breeding in that country. The same feature is noticeable in Holland, where the number of sows covered on June 1, 1931, is reported as only 87 per cent. of the number on the same date last year, while fat pigs show a decline. In Germany also, although the total number of pigs had increased, the number of breeding sows under 1 year old was 21 per cent. less than on June 1, 1930, while the total number of pregnant sows had also declined. These figures suggest that the peak in pig breeding on the Continent may be passed, though production will necessarily continue to be heavy for a considerable time. Danish killings show a slight tendency to fall, the average for the second quarter this year being 118,700 per week against 123,200 in the first quarter. The figures over the 6 months show an average increase of 29 per cent.

Store pigs continue to decline with the fall in fat pig prices, the average for all grades in June being 33*s.* 2*d.* per head as against 36*s.* 9*d.* the previous month. Supplies this year appear to have been relatively large, as the numbers shown at representative markets in the first 28 weeks were 258,000

as compared with 217,000 in the same period last year, an increase of 19 per cent. Feeding stuffs, although some descriptions are slightly cheaper, show little change; a typical mixture composed of barley meal, maize meal, middlings and oats would have cost £6 5*s.* 0*d.* per ton in July as against £6 3*s.* 9*d.* a month earlier.

Eggs.—Imports of eggs in the first 6 months of this year have been in the aggregate about 6 per cent. less than in the same period last year, but supplies have been plentiful and prices on a lower level than in 1930. Taking the 10 weeks from the middle of April to the middle of June, National Mark standard eggs ranged from 10*s.* to 10*s.* 9*d.* per 120, with an average of 10*s.* 4*d.* In 1930, over the same period, the average was 12*s.* 7*d.* per 120 with a range of 12*s.* to 13*s.* 6*d.* On these figures prices are about 18 per cent. less than last year. As from the middle of June prices began to move upwards, and a month later stood at 14*s.* 9*d.* per 120.

Cheaper feeding stuffs may to some extent compensate for the reduction in the price of eggs. According to figures given in this JOURNAL last month, the average cost of poultry food used in the commercial demonstration at Stanmore was 6*s.* 8½*d.* per cwt. from January to March, 1931, whereas 6 months earlier it was 8*s.* 5*d.* per cwt.—a drop of nearly 20 per cent.

A noticeable feature in the supplies has been the large imports from Denmark, which, over the first 6 months of this year, have been 20 per cent. above those of 1930; while in the 2 months April and May, the increase was as much as 56 per cent. Holland has also sent larger quantities, though receipts from Sweden, Belgium and France decreased. On the whole, the supplies of the higher-priced imported eggs that compete most directly with English eggs have been slightly larger this year, and home production has no doubt also increased at the same time.

Butter.—Plentiful supplies of farmhouse butter have been on sale at country markets this season, production having probably been stimulated by the low prices obtainable for surplus milk. Prices kept steady during June at an average of 1*s.* 2¼*d.* per lb. which is about 2*d.* per lb. below last year's level, but by the middle of July rather more money was obtainable as supplies tended to fall off.

Imported butter continues to be received in large quantities, the receipts for June being 757,000 cwt. as against 683,000 cwt. in June, 1930. This increase was almost entirely due to larger supplies from Australia and New Zealand. Shipments from

these two countries continued heavy well into July, and, though declining, are likely to remain on a rather higher level than last year. Supplies from the Irish Free State since the opening of the season have been smaller by one-third, but supplies from the Continent generally have in the aggregate been about last year's level. Receipts from Russia in May and June amounted to 68,000 cwt. or about 4½ per cent. of the total imports in these two months, and compare with 33,000 cwt. and 79,000 cwt. in the same months of the past two years.

The apparent consumption shows an increase of 15 per cent. so that, notwithstanding the larger imports, the total quantity of butter in cold storage, on July 11, was 798,000 boxes as against 1,188,000 boxes at the corresponding date in 1930, when stocks were nearly at the highest point of the year. Prices in the middle of July showed a rather firmer tendency, Danish butter being quoted by the London Provision Exchange at 121*s.* 6*d.* per cwt., which is slightly better than in any week since the end of April.

Owing to favourable weather conditions, production of butter in Australia has been exceptionally heavy, and the quantities graded during the 12 months to the end of June amounted to 1,453,000 cwt. as compared with 973,000 in the preceding year. Shipments to the United Kingdom, which comprise by far the largest portion of the total exports, were the largest ever recorded, and 59 per cent. greater than in the preceding season. A feature of the trade has been the extent to which the exports have been maintained late in the season, the shipments in the last three months having been 314,000 cwt. as compared with 97,000 cwt. in the corresponding period last year.

Cheese.—New English cheese was quoted on the London Provision Exchange for the first time this year on July 10 at 70*s.* to 75*s.* per cwt., a rate which compares with 90*s.* to 94*s.* on the same date in 1930. Last year, however, new cheese began to be quoted on May 23, when prices started at 86*s.* to 88*s.* per cwt. Canadian new cheese (finest coloured) was quoted at 59*s.* to 62*s.* this year as against 81*s.* to 84*s.* last year.

Imports of cheese from New Zealand in June were on a reduced scale, and indications suggest moderate receipts for the remainder of the season. Receipts from Canada since the opening of the season have so far been about the same as last year, but the quantity of cheese offered for grading in Ontario and Quebec in each of the last 10 weeks has been below the

corresponding weeks last year, which suggests that shipments may be lighter.

A noteworthy increase has taken place in the importation of milk powder, receipts in the first five months of this year amounting to 176,000 cwt. as compared with 118,000 cwt. in the same period of 1930, a rise of 48 per cent. This expansion is probably due to the larger use of milk powder in the commercial manufacture of ice cream and cream substitutes.

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AUGUST ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

The Corn Harvest.—At no season of the year is there a greater interest in farming operations than during this month. This interest is not confined to those immediately engaged in the work, but is common in the minds of financial, commercial and business men as well as the working population.

Before the industrial era the value of the harvest was an important contribution to the national income, and though the contribution is now smaller in proportion there is no doubt that its former importance accounts for the inherent interest that most people still take in the safe gathering of the harvest.

The use of machinery has materially reduced the amount of manual labour employed, but harvest-time is still the busiest season of the year on the arable farm. Weather conditions are an important factor both before and during harvesting operations. A laid crop reduces the yield and increases the cost of harvest. The strength and standing capacity of the straw is a feature of importance in selecting varieties of grain. Much remains to be done in this direction, and both barley and winter-sown oats are far from satisfactory in this respect. There is as yet no variety of real winter-hardy oats that has a stiff and good standing straw.

Apart from the question of variety the thickness of seeding is an important factor in the standing power of a crop. Too thick seeding results in a shorter and weaker straw. Even distribution of the seed is also a factor. A noticeable improvement in the standing power of a crop can be effected by sowing the seed thinly in two directions either by drilling half each way or by broadcasting half on a pressed furrow and drilling the other half across the furrows. Still another method that has been practised to a limited extent is to use a mixture

of autumn-sown beans with autumn-sown oats ; it has been asserted that such a practice not only helps to prevent the straw from becoming seriously lodged, but does not interfere with the yield of oats. The beans are therefore extra produce and can readily be separated or the whole can be ground together for stock feeding. Trials of a practice such as this are required and more information obtained as to the variety of bean most suitable and how the two crops can be made to ripen at the same time.

The main factors in determining the standing power of the straw are the manurial condition of the land, the suitability of the weather for heavy growth, and the incidence of heavy rainfall and strong winds.

The natural fertility of the soil may be such as to promote heavy crops, which are in danger of lodging during bad weather. This applies particularly to Fen types of soils and soils containing a high proportion of organic matter. On any soil heavy dressings of nitrogenous manures may cause a soft type of growth in the crop, which is more liable to lodge in consequence. This soft, quick growth may not only arise after the application of quick-acting artificial manures, but it is just as likely to follow heavy dressings of farmyard manure, or to result when cereals are grown after a good clover ley or temporary pasture having a large accumulation of nitrogen. In districts where temporary pastures are a feature of the rotation the use of wild white clover may so enrich the soil that the difficulties of harvesting are materially increased, and many now find it advisable to take a crop of potatoes or other root crop immediately after the ley so as to reduce the fertility before sowing a cereal crop.

The situation of particular fields sometimes accounts for weather damage before the crop is cut. Hills and high woods divert air currents and a great swirling of the crop by high winds is apt to produce a condition particularly difficult to deal with at harvest. In such instances short, strong straw crops are a great advantage, but some farmers are of opinion that the best practice is to mix a short-strawed variety with a long-strawed variety. This method is fairly commonly practised by some farmers, with the object of obtaining an increased yield as well as a sheaf of corn that does not suffer so badly during wet weather while the crop is in the shock or stook.

During good weather harvesting operations are easy and little loss need arise, but in adverse circumstances much damage can result and this can be minimized by attention to a few

minor points that are obvious but not always stressed or practised.

The grain should be dry when cut and should be shocked up before rain falls. The position at which the sheaf is tied should be varied under certain conditions. When the crop is a good one and free from weed growth or grass and clover the string can be in any position to secure the whole of the material. Where weed growth or green material is plentiful the string should be tied nearer the head in order to give a better opportunity for the base to spread and the green material to dry.

Corn that is well set up in shocks will suffer very much less during bad weather than if set up badly. The common size of the shock is six sheaves, which should be so set that the centre pair will act as supports to the pair placed at each end; the grain will thus be fairly compact whilst the bottoms will all be slightly spread out. Such a shock will withstand a good deal of wind and rain, but care should be taken that any sheaves or shocks that fall or are blown over should be re-set as soon as possible, or wet sheaves may find their way to the rick and cause some damage.

Rick building is well understood by most practical men, but a few faults often give rise to damaged grain. The foundation should be prepared with care; special staddles or frames on mushroom-shaped stands are in use on some farms, so ensuring that the grain is well removed from the damp ground and less liable to become infested with rats and mice. Where these are not available some material must be used to form a bottom of sufficient thickness to prevent the grain becoming damaged by damp; brushwood, faggots, or a good layer of straw will serve the purpose. The rick should be commenced so that none of the heads of the sheaves lie on the ground, and throughout the whole of the building operations the heads of the sheaves should always be at a higher level than the bottoms, and should so remain when the rick has settled down. This is very important in all outside sheaves and particularly in the sheaves in the head of the rick. However well made the rick may be there should be no delay in thatching, and harvest is not finished until the thatching is completed.

Pastures.—In all districts growth of fresh grass during August is very much dependent on the moisture content of the soil or on the rainfall during the month. There is less tendency for grasses to form stems and run to seed, and an increase of leafy herbage and a lower fibre content may be expected. If

there is much rough growth or if thistles have not been cut, the mower should be run over the pastures as early in the month as possible. The increased area of grass land has brought about an increased number of grassland sheep on farms and in districts where these have hardly been known before.

The object of such a method of stocking is to depend mainly on pastures to supply food throughout the year, with a possible small supplement of roots just before and after lambing. At the present time the farmer with a breeding flock on grass land

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended July 8								Cost per unit at London	
	Bristol		Hull		L'pool		London			
	£	s.	£	s.	£	s.	£	s.	s.	d.
Nitrate of soda (N. 15½%) ..	10	0*d*	10	0*d*	10	0*d*	10	0*d*	12	11
Nitro-chalk (N. 15½%) ..	9	7*d*	9	7*d*	9	7*d*	9	7*d*	12	1
Sulphate of ammonia :—										
Neutral (N. 20·6%).. ..	9	10*d*	9	10*d*	9	10*d*	9	10*d*	9	3
Calcium cyanamide (N. 20·6%)	8	18*e*	8	18*e*	8	18*e*	8	18*e*	8	8
Kainit (Pot. 14%)	3	8*a*	2	19*a*	2	19*a*	3	3*a*	4	6
Potash salts (Pot. 30%) ..	5	6*a*	4	18*a*	5	0*a*	4	19*a*	3	4
„ (Pot. 20%) ..	3	17*a*	3	9*a*	3	8*a*	3	12*a*	3	7
Muriate of potash (Pot. 50%)..	9	17*a*	9	3*a*	9	2*a*	9	7*a*	3	9
Sulphate „ (Pot. 48%)..	11	19*a*	11	6*a*	11	5*a*	11	7*a*	4	9
Basic slag (P.A. 15½%)‖ ..	2	10*c*	2	0*c*	..		2	6*c*	2	11
„ (P.A. 14%)‖ ..	2	5*c*	1	14*c*	1	14*c*	2	1*c*	3	0
„ (P.A. 11%)‖ ..	..		1	9*c*	1	9*c*	..		..	
Ground rock phosphate (P.A. 26-27½%)‖	2	10*a*	..		2	9*a*	2	7*a*	1	9
Superphosphate (S.P.A.16%)	3	11	..		3	9	3	1	3	10
„ (S.P.A.13½%)	3	5	2	15	3	3	2	15	4	0
Bone meal (N.3½%, P.A.20½%)	8	15	7	10	7	0	6	15	..	
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	5	19*b*	5	5*f*	6	0	4	15	..	

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, for delivery during the month, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

should make up his mind as to which pastures he will allow to rest and so provide a pasture where ewes can be flushed.

Flushing is most important in order to obtain a high percentage of lambs, and under grassland conditions a fresh clean pasture is well suited and arrangements for such must be made well ahead. Apart from sheep the provision of a lengthened grazing period in the autumn for dairy cows and cattle generally should be made now. It has been suggested that applications of nitrogenous manures in August will bring about this result. It is, however, doubtful whether such dressings are economical; the division of pastures so that they can be grazed and rested in alternate periods would appear to be more so. A rest during August will give good grazing in September, and in favourable districts the land rested in September will be very useful during the last part of October. Where cattle are to be wintered outside some grass fields should be rested now so as to produce a good bulk of produce for use during winter. Pastures that are due for manurial treatment should be well grazed from now onwards, as the benefit obtained from phosphatic manuring is dependent on the ground being comparatively free from rough herbage at the time the manures are applied.

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NOTES ON FEEDING

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Minerals.—Evidence accumulates regarding the importance of minerals in general, and lime in particular, in the feeding of farm live stock. Colonel Bowes has described a disease of ewes, known in certain districts by the name of "Lambing Sickness." Bowes is supported by other veterinary investigators in the conclusion that in this disease there is definite hypo-calcæmia similar to the condition found in milk fever in cows. He suggests that "lambing sickness" is probably associated with a shortage of minerals in the herbage of the grazings concerned, and that steps might be taken to prevent the disease by improving the land with suitable fertilizers, or even where possible by feeding minerals to ewes throughout the winter. It is recognized that a practical difficulty may arise in the latter connexion, more especially on mountain grazings and with mountain and hill ewes. Hill ewes are not ready "trough-feeders," neither is it practicable to treat mountain grazings with fertilizers. There would therefore appear to be

scope for wider trial with mineral pellets of the kind used in the Yorkshire investigations. Reasonably priced pellets, which would be attractive to sheep, should be likely to meet a ready sale among those flock masters who are anxious to combat "lambing sickness" and those deficiency diseases believed to arise from an inadequate supply of minerals.

A somewhat peculiar and serious disease has appeared among cows in Northamptonshire, at intervals during the last few years. A disease showing similar symptoms was recently reported from Northumberland and other parts of the country. The Veterinary Officer (Mr. T. F. Spencer) who has been associated with the treatment of the disease in this county is of opinion that it is not of bacterial origin. The disease invariably has occurred in cows at grass, generally cows that have calved six or eight weeks earlier. Some cases have proved immediately fatal, following severe convulsions or "fits," but many have recovered after the calcium and oxygen treatment, as used in Milk Fever. It would therefore seem that the trouble is due to a breakdown of calcium metabolism, and may be associated with an inadequate lime supply in the food. Certain soils in Northamptonshire are markedly deficient in lime, and it may be that this fact is a contributory cause of the disease.

The pens of pigs exhibited by the Harper Adams Agricultural College on the College educational stand at the recent R.A.S.E. Show at Warwick demonstrated particularly well the necessity for the inclusion of both sufficient mineral matter and protein in the rations of fattening pigs. It was of special interest that highly complicated and expensive mineral mixtures do not appear to be required, and that mal-nutrition can be prevented, as far as the supply of minerals is concerned, by the inclusion of lime or ground chalk and common salt in the proportion of 2 to 1. The quantities recommended by the College authorities should be carefully studied, as it is of importance not to give too much salt to pigs. Any excess of salt in pig rations may readily give rise to gastric troubles.

The matter of minerals and health in relation to grass land has been widely investigated and discussed in recent years. It is universally recognized that applications of fertilizers and lime have enormously improved the output of British grass land. Orr draws attention to another point of interest, namely, that many farmers are conscious that there has been marked improvement in the health of live stock, over and above the direct and measurable advantage of increased yield of herbage. Some go so far as to say that they are sure that losses in live stock have been appreciably diminished by

the use of suitably balanced mineral fertilizers and lime on their pastures.

As time goes on, no doubt more interest will be taken and greater skill developed in estimating the healthiness and feeding quality of herbage, apart from its mere bulk. At the present stage it is recognized that grass overdone with nitrogen or forced with liquid manure is different from grass on an essentially healthy grazing.

The feeding quality of herbage and its completeness as a food depend upon the amount of mineral matter of the right sort present and available in the underlying soil. It may be that, through neglect of liming during many decades, together with the continuous depletion of the lime supplies of the soil, and the higher and more rapid rate of production now demanded of all classes of stock, we have reached a stage on many farms where the cumulative deterioration in lime supply is such that deficiency diseases are caused and other diseases encouraged. It is of the highest importance, therefore, that we should consider the treatment of pastures and arable soils from this angle and at the same time devote more attention to the provision of lime in the rations of farm stock. The custom of providing rock salt for stock is widespread, though one wonders whether it is as commonly attended to as it was some few years ago. On the other hand, the need for feeding lime is by no means so extensively appreciated. We frequently hear from farmers that they actually experience difficulty in obtaining limestone or chalk that is sufficiently finely ground for feeding purposes. It is important that lime should be very finely ground when used for feeding, and this point merits more attention from those engaged in the trade.

"Sheep sick" pastures, pig and poultry sick "runs," are to-day giving cause for concern to many stock-keepers. The concentration of any class of stock on a limited area is known to lead to various troubles, which are doubtless of complex origin, but the simplest and most effective remedial measures at the command of the farmer are the resting of the land and, on small areas, an application of lime and, in certain circumstances, of salt. The sweetening effect of this treatment, however, depends to a great extent upon getting the herbage really short by some means or another at least once a year. In this connexion the value of the mowing machine is becoming more and more recognized for its usefulness in the maintenance of healthy pastures.

Prices of Feeding Stuffs.—Farmers buying forward foods for winter use are finding prices of high-grade protein-rich foods attractive by comparison with those of even last year. Linseed cake and decorticated ground nut cake at prices in the neighbourhood of £7 10*s.* per ton should prove economical purchases, for the purpose of balancing home-grown cereals. Linseed cake is a tried favourite and at current prices will, no doubt, find buyers amongst many of those who were reluctantly compelled by its high price to abandon its use in recent years.

Prices of maize products are also favourable. Maize gluten feed at between £5 and £5 10*s.* per ton will be found a useful substitute for beans and peas. Maize germ meal at about the same figure is worth consideration as an alternative for oats. The increasing use of maize itself as a poultry food is one of the features of recent developments in poultry nutrition and one that is attracting the critical attention of progressive poultry feeders.

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DESCRIPTION	Price per qr.		Price per ton	Manurial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 7	0 11	5 16	72	1 7	0·85	9·6
Barley, British feeding	—	—	5 15	0 9	5 6	71	1 6	0·80	6·2
,, Canadian No. 3 Western	19 6	400	5 10	0 9	5 1	71	1 5	0·76	6·2
,, Persian	16 9	,,	4 13*	0 9	4 4	71	1 2	0·62	6·2
,, Russian	19 3	,,	5 8*	0 9	4 19	71	1 5	0·76	6·2
Oats, English, white	—	—	7 0	0 10	6 10	60	2 2	1·16	7·6
,, ,, black and grey	—	—	6 5	0 10	5 15	60	1 11	1·03	7·6
,, Canadian No. 2 Western	19 3	320	6 15	0 10	6 5	60	2 1	1·12	7·6
,, ,, No. 3 ,,	18 3	,,	6 8	0 10	5 18	60	2 0	1·07	7·6
,, ,, Mixed Feed	12 6	,,	4 7*	0 10	3 17	60	1 3	0·67	7·6
,, Argentine	13 9	,,	4 17	0 10	4 7	60	1 5	0·76	7·6
,, Chilian tawny	14 6	,,	5 2	0 10	4 12	60	1 6	0·80	7·6
,, ,, white	22 3	,,	7 15	0 10	7 5	60	2 5	1·29	7·6
,, Russian	19 0	,,	6 13	0 10	6 3	60	2 1	1·12	7·6
Maize, Argentine	18 6	480	4 7	0 9	3 18	81	1 0	0·54	6·8
,, South African	21 9	,,	5 2†	0 9	4 13	81	1 2	0·62	6·8
Peas, Indian	—	—	8 0†	1 0	7 0	69	2 0	1·07	18
,, Japanese	—	—	17 15†	1 0	16 15	69	4 10	2·59	18
Dari	—	—	9 0	0 11	8 9	74	2 3	1·20	7·2
Milling offals—									
Bran, British	—	—	4 5	1 0	3 5	42	1 7	0·85	10
,, broad	—	—	4 17	1 0	3 17	42	1 10	0·98	10
Middlings, fine, imported	—	—	5 12	0 16	4 16	69	1 5	0·76	12
,, coarse, British	—	—	5 5	0 16	4 9	58	1 6	0·80	11
Pollards, imported	—	—	4 12	1 0	3 12	60	1 2	0·62	11
Meal, barley	—	—	6 15	0 9	6 6	71	1 9	0·94	6·2
,, maize	—	—	5 5	0 9	4 16	81	1 2	0·62	6·8
,, ,, germ	—	—	5 5	0 14	4 11	85	1 1	0·58	10
,, locust bean	—	—	5 5	0 7	4 18	71	1 5	0·76	3·6
,, bean	—	—	8 7	1 3	7 4	66	2 2	1·16	20
,, fish	—	—	17 0	3 1	13 19	53	5 3	2·81	48
Maize, cooked flaked	—	—	6 5	0 9	5 16	83	1 5	0·76	8·6
,, gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	8 10	1 8	7 2	74	1 11	1·03	25
,, ,, ,, 9% ,,	—	—	8 2	1 8	6 14	74	1 10	0·98	25
,, ,, ,, 8% ,,	—	—	7 17	1 8	6 9	74	1 9	0·94	25
Soya bean cake, 5½% oil	—	—	7 12*	1 19	5 13	69	1 8	0·89	36
Cottonseed cake—									
,, ,, English, 4½% oil	—	—	4 17	1 6	3 11	42	1 8	0·89	17
,, ,, Egyptian, 4½% ,,	—	—	4 7	1 6	3 1	42	1 5	0·76	17
Ground-nut cake, 6-7% oil	—	—	5 17*	1 6	4 11	57	1 7	0·85	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 10	1 19	5 11	73	1 6	0·80	41
Palm kernel cake, 4½-5½% oil	—	—	6 0§	0 16	5 4	75	1 5	0·76	17
,, ,, ,, meal 4½% ,,	—	—	6 10§	0 16	5 14	75	1 6	0·80	17
Palm kernel meal, 1-2% ,,	—	—	5 2	0 17	4 5	71	1 2	0·62	17
Feeding treacle	—	—	5 0	0 9	4 11	51	1 9	0·94	2·7
Brewers' grains, dried ale	—	—	4 7	0 17	3 10	48	1 6	0·80	13
,, ,, ,, porter	—	—	3 17	0 17	3 0	48	1 3	0·67	13
Malt culms	—	—	4 10†	1 6	3 4	43	1 6	0·80	16
Dried sugar beet pulp (*a*)	—	—	3 15	0 8	3 7	65	1 0	0·54	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of June, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 3
Maize	81	6·8	4 14
Decorticated ground nut cake	73	41·0	7 10
,, cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·29 shillings, and per unit protein equivalent, 1·66 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 9
Oats	60	7·6	4 10
Barley	71	6·2	5 2
Potatoes	18	0·6	1 4
Swedes	7	0·7	0 10
Mangolds	7	0·4	0 10
Beans	66	20·0	5 18
Good meadow hay	37	4·6	2 15
Good oat straw	20	0·9	1 7
Good clover hay	38	7·0	3 1
Vetch and oat silage	13	1·6	0 19
Barley straw	23	0·7	1 11
Wheat straw	13	0·1	0 17
Bean straw	23	1·7	1 12

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6*d*. net.

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MISCELLANEOUS NOTES

The Agricultural Index Number

THE June index of agricultural produce at 23 per cent. above 1911-13 was one point higher than in May, but 8 points below the level of June last year. There were a considerable number of seasonal changes in prices during the month under review and for the most part the movements were normal. In the case of fat cattle and potatoes, however, the increases were fairly large while prices for fat sheep were maintained longer than usual, and these commodities account for the rise in the general index. Fat pigs on the other hand declined rather more sharply than is customary and eggs showed only a very slight rise.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	—
August..	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—There were slight increases in the average prices of wheat and oats, the former advancing by 4*d.* to 6*s.* per cwt. and the latter by 2*d.* to 6*s.* 9*d.* Barley declined by 2*d.* to 6*s.* 9*d.* per cwt. For all three cereals, however, the indices were a little higher at 24, 10 and 9 per cent. respectively below pre-war.

Live Stock.—The increase in the average price of second quality fat cattle was nearly 2*s.* per live cwt. and the relative index figure was 4 points higher at 23 per cent. above pre-war. Store cattle advanced by 3 points to 28 per cent. above the base level, but dairy cattle at 23 per cent. above were one point lower on the month, the decline in the head price being nearly 10*s.* Fat sheep were unchanged in price as compared with May, but as a slight fall occurred in the base period the index showed a rise of 5 points. Store sheep also maintained a higher level than usual, the index in this case increasing by 17 points to 45 per cent. above pre-war, or the same as for

fat sheep. Bacon pigs and porkers were considerably cheaper than in May, the index for the former being 10 points and for the latter 13 points lower at 11 and 20 per cent. above 1911-13. The index for store pigs fell by 11 points and the average price by about 3*s.* 6*d.* per head.

Dairy and Poultry Produce.—Milk contract prices in June were very little different from those ruling in May, while the slight decline in butter values was very similar to that in the corresponding period of the base years. Cheese fell to a slighter extent than in 1911-13 so that the index moved upwards by 3 points. The alteration in egg prices was considerably smaller than usual and the index at only 2 per cent. above pre-war was 5 points lower than in May, and 27 points below the level of a year ago. Poultry were cheaper on the month.

Other Commodities.—A high level of potato prices was reached in June, the index being 100 per cent. above June, 1911-13. Hay was a trifle cheaper at 11 per cent. below pre-war. In the fruit and vegetable groups the indices show that gooseberries at about 10 per cent. above pre-war sold at much the same level as in 1930, but strawberries were rather dearer at about 45 per cent. above pre-war. A further decline was recorded for wool, the index for June being 32 per cent. below 1911-13.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	June	June	Mar.	Apr.	May	June
Wheat	21	7	—30*	—32*	—28*	—24*
Barley	33	—4*	— 3*	—2*	—10*	—9*
Oats	26	—16*	—18*	—15*	—11*	—10*
Fat cattle	31	27	23	20	19	23
„ sheep	59	66	30	37	40	45
Bacon pigs	70	46	24	23	21	11
Pork „	65	52	46	40	33	20
Dairy cows	30	29	30	28	24	23
Store cattle	22	28	25	23	25	28
„ sheep	65	65	31	31	28	45
„ pigs	77	101	75	63	52	41
Eggs	40	29	24	18	7	2
Poultry	63	57	47	42	63	52
Milk	57	55	50	53	47	48
Butter	46	24	18	15	8	7
Cheese	67	42	23	24	22	25
Potatoes	—34*	—40*	70	82	85	100
Hay	27	25	—9*	—10*	—10*	—11*
Wool	50	—1*	—20*	—16*	—21*	—32*

* Decrease.

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held on June 23, 1931, at 7 Whitehall Place, London, S.W.1, the Right Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered a notification from the North Riding of Yorkshire Agricultural Wages Committee varying the minimum and overtime rates of wages at present in force in their area and proceeded to make an Order cancelling the existing rates as from July 26, 1931, and bringing fresh rates into operation on July 27, 1931. The minimum rates thus fixed are in the case of male workers of 21 years of age and over 32*s.* 6*d.* (instead of 33*s.* as at present) per week of 50 hours in winter (instead of 48 hours as at present) and 52½ hours in summer, with in addition payment at 3*d.* per hour in the case of workers who are boarded and lodged by the employer and 6*d.* per hour for workers who are not so boarded and lodged in respect of employment in excess of those hours on the care of and attendance upon animals. The overtime rates of wages for male workers of 21 years of age and over, other than casual workers, are 10*d.* per hour on weekdays and 1*s.* per hour on Sundays. The minimum rate for male casual workers of 18 years of age and over is 6*d.* per hour for all time worked. In the case of female workers of 18 years of age and over the minimum rate is 6*d.* per hour for a week of 44 hours with overtime at 9*d.* per hour.

Copies of the Order in full may be obtained on application to the Secretary of the Agricultural Wages Board.

* * * * * *

Enforcement of Minimum Rates of Wages.—During the month ending July 14 legal proceedings were instituted against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Cornwall ..	Truro	—	0 10 6	5 0 0	1
Cornwall ..	Wadebridge	*	—	—	2
Derby ..	Ashbourne .	1 0 0	0 10 6	11 11 9	1
Derby ..	Ashbourne .	2 0 0	1 1 0	44 5 0	2
Derby ..	Ashbourne .	1 0 0	0 10 6	23 15 0	1
Derby ..	Ashbourne .	1 0 0	0 10 6	10 12 0	1
Derby ..	Glossop ..	1 1 0	1 1 0	15 0 0	1
Oxford ..	Chipping Norton	1 0 0	—	16 3 10	1
		£7 1 0	£4 4 0	£126 7 7	10

* Case dismissed.

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Foot-and-Mouth Disease.—During the period June 17-July 27 (both dates inclusive) 69 outbreaks of foot-and-mouth disease have been confirmed in Great Britain, of which 60 occurred before the end of June.

Since the last issue of this JOURNAL went to press a new centre of disease has been found to exist in Buckinghamshire and at the present time, July 27, animals on four separate premises have been affected.

The various Infected Areas in the North of England and the South of Scotland have been reduced in size as far as possible.

The Order prohibiting the importation of cattle, sheep, goats and swine from Ireland, which the Minister made on June 17, has been

modified. Both store and fat animals may now be brought from the Irish Free State and from Northern Ireland (from places within infected areas) to Great Britain, but such animals may not be moved from the landing places except direct to premises where they must be detained for ten days or to slaughterhouses for slaughter within ten days. The movement of imported Irish stock to markets in this country is not yet permitted.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Hampshire: Mr. D. C. Bower, N.D.A., N.D.D., has been appointed District Lecturer in Agriculture.

Middlesex: Mr. H. R. Williams, B.Sc., has been appointed Agricultural Organizer, *vice* Mr. E. Rea, N.D.A., N.D.D.

COUNTY AGRICULTURAL STAFFS: WALES

Glamorgan: Mr. D. E. Davies, M.R.C.V.S., has been appointed Instructor in Veterinary Hygiene, *vice* Mr. F. Blakemore.

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NOTICES OF BOOKS

The Economic and Social History of an English Village (Crawley, Hampshire) A.D. 909-1928 By Norman S. B. Gras and Ethel C. Gras. Pp. xv+730. Harvard Economic Studies. Vol. XXXIV. (Cambridge, Mass., U.S.A.: Harvard University Press. 1930. Price 34*s.* net.)

The work of Professor Gras has already been introduced to readers of this JOURNAL in a review of his *History of Agriculture in England and America*, 1927. Students of economic history will also be acquainted with *The Evolution of the English Corn Market*, 1915, and *Early English Customs System*, 1918, his previous works.

The present study, which has been made in collaboration with his wife, deals with the history of the village of Crawley, Hampshire, from A.D. 909 to 1928. Professor Gras explains in his preface that he thinks it more important to present the documents on which historical opinions are based rather than to urge the opinions themselves. For this reason the book is divided into two parts, (1) a general introduction which gives a brief but adequate summary of the story of the village, and (2) a collection of documents and statistics covering the whole period.

Since Crawley is situated in a district of England which was settled at an early date, there has been less change here than might have been expected. Nevertheless, the changes which have taken place may be said to be characteristic of those that have occurred over a wide area of this country. The story as told in the introduction does its best to supply the lacunae which inevitably occur in the documents. It would be astonishing if a complete set of documents, covering such a protracted period for even so small a community as Crawley, could be collected, but what is presented in this book is sufficient for the purpose, and we must thank Professor and Mrs. Gras for a production that will be of undoubted value to the student of agricultural history in England.

It cannot fail, also, to be of interest to the general reader who wishes to know the origins from which modern rural life has sprung.

Maize in South Africa. By A. R. Saunders. Pp. 284. (London: South Africa Central News Agency Ltd., 5 New Bridge Street, E.C.4. Price £1 net.)

Shortly after the discovery of America, where maize seems to have been indigenous, it was introduced into other parts of the world. Records show that seed was shipped from Amsterdam to the Cape in 1655, and once the plant was established rapid distribution became easy by means of colonists, missionaries and natives. The first trekkers carried the plant far northward, and it rapidly gained a foothold in the wastes of the hinterland. Not only does maize now occupy a position of pre-eminent importance as a food crop, but an export trade of considerable dimensions has been developed during recent years. In this monograph, Mr. Saunders, who is Senior Research Officer to the Department of Agriculture in the Union, treats the subject from practically every point of view, tracing the origin of the plant, botanically and historically, and discussing in detail its structure and function, the diseases and pests which attack it, its relation to climate and soil, methods of planting, cultivation and harvesting and other matters. There are 72 illustrations, mostly of a practical character, useful statistical tables, and a list of literature cited. The book contains a large amount of information in concise and lucid form, and should prove very useful to students in our agricultural colleges who are intending to take up positions overseas.

The Marketing of Fruit and Vegetables in the Vale of Evesham. By M. A. Abrams, Ph.D., B.Sc. (Econ.). Avoncroft Rural Studies, I. Pp. 60. (Evesham: Avoncroft College for Rural Workers. Price 1*s*.)

This study throws a useful light upon certain marketing problems faced by market growers in the Evesham district. As the writer points out, it has the limitation that the material it contains is drawn mainly from the marketing of cabbages, asparagus and plums. After a broad discussion of the present economic position of growers, a brief outline is given of prevailing methods of distribution, transport, grading and packing. Generally, the writer does not attempt to give detailed information on any of these topics. Special reference, however, is made to the activities of the Pershore Co-operative Fruit Market and of the Littleton and Badsey Growers, Ltd. The experimental asparagus-grading scheme of the latter Society, during the 1930 season, was aided financially by the Ministry of Agriculture and Fisheries.

Dr. Abrams recognizes the importance of grading and standardization in relation to fruit and vegetables, but finds fault with the National Mark Scheme, partly on account of its voluntary character; he would, apparently, prefer to "bring the element of coercion to the ways of the grower"!

For a solution of the local marketing problem, Dr. Abrams looks to some form of unified direction and control of the supplies of the district, in co-ordination with those of all other market gardening areas in this country, such as would be possible under the Agricultural Marketing Bill, at present before Parliament

The Marketing of Farm Produce. Part III: Hops. By D. Skilbeck, Agricultural Economics Research Institute. (Oxford: The Clarendon Press. London: Humphrey Milford. 1931. Price 2s. 6d. net.)

An analysis of marketing which presents "a complete picture in miniature of the main economic evils which beset farming" (p. 13) should be of special interest to all farmers. Such an analysis is presented in this recently published report on Hop Marketing, a con-

siderable part of which is devoted to a study of the "successful rationalization of their marketing by the hop growers, and the recent abandonment of this rationalization in the face of the obstruction of a small minority outside the main collective movement."

In its productive and marketing aspects the hop industry occupies a unique position in the agriculture of this country. The commercial crop is practically concentrated in two areas—Kent and East Sussex, and in East Herefordshire and West Worcestershire. Home production is extremely variable, yields being highly sensitive to climatic conditions. The demand on the other hand is very inelastic, and when this is related to a very variable supply it is not surprising that prices vary enormously from year to year. Thus, despite the fact that hops can be stored for some years, the casual surplus is a paramount problem of the industry. The second feature of the demand is that it is distributed over the country, and this, together with the localization of production, is largely responsible for the unique marketing structure of the industry.

The history of hop control falls into two distinct stages: (1) State control, enforced from 1917 to 1924, first under D.O.R.A. Regulations and subsequently by special Act of Parliament, and (2) the voluntary control exercised in respect of the crops of 1925-28 inclusive.

War-time control started with the issue of an Order in May, 1917, requiring a reduction of the hop acreage to 50 per cent. of the 1914 figure, and this was very shortly followed by the establishment of a Hop Control Board, comprising representatives of growers, factors, merchants and brewers under a Hop Controller, which was to take over existing stocks and to be responsible for purchases and sales of all future supplies. The Control was concerned mainly with limiting output and ensuring that the whole of it was absorbed by brewers. With the withdrawal of the D.O.R.A. Regulations, an Act was passed in 1920 to continue control for another five years in order to encourage the replanting of the grubbed acreage in anticipation of an increased demand for hops. The expected increase in beer consumption after the War, however, proved to be short lived, and with an expansion of acreage the main problem of the Control Board during this period was that of dealing with a quite unexpected surplus. The adjustment of production to demand was sought by a number of methods, and it was inevitable that some of these should have been subjected to considerable criticism.

State Control came to an end in 1924, and growers then decided to set up a central sale agency to handle the 1925 crop provided that supply contracts could be secured for not less than 90 per cent. of the total acreage. This condition was met and English Hop Growers, Ltd., was established as a co-operative society with two main objects, *i.e.*, to prevent the expansion of acreage and to regulate the flow on to the market so that surpluses should not involve the collapse of prices. The Society began in favourable circumstances, but it had no power to force a reduction of acreage on its own members, much less on outside growers, and the absence of this power caused serious trouble. Campaigns for voluntary reductions of acreage made in 1926 and 1927 led to dissatisfaction because non-members did not take their share in acreage reduction and were free to sell all their produce at ruling prices, while members only obtained such prices for about 90 per cent. of their restricted output. Moreover, the success of the society stimulated outside production to such an extent that by 1929 the Society controlled no more than 80 per cent. of the total acreage. Eventually the Society was wound up, and after nine years of control the hop industry reverted to individualism; the subsequent story, as is well known, has been one of disaster.

Two incidents in the history of hop control are very interesting. A scheme for voluntary control to follow the suspension, in 1920, of War-time control, was rejected "as being unworkable without compulsory powers" (p. 33); and in September, 1927, the Worcestershire branch of the National Farmers' Union passed a resolution requesting "the Ministry of Agriculture to bring pressure on those hop growers standing aloof from the selling agency with a view to their compulsory inclusion in the hop-selling scheme" (p. 48). The writer is quite emphatic that the voluntary control would have been impossible without previous State control, but that its survival demanded legislative support. The failure of English hop growers "leaves but little doubt of the answer to the question of the right of the majority . . . to coerce the obstructive minority" (p. 52) and testifies to the "power of a small number (of producers) to wreck any attempt by the majority to rationalize their methods of business" (p. 13).

The Reclamation of Land from the Sea. By F. M. du-Plat-Taylor, M.Inst.C.E., M.I.Mech.E., M.I.Struct.E., M.Cons.E., M.Soc.I.C. (France). Introduction by Sir George L. Courthope, Bart., M.C., M.P., D.L. Pp. 153. 83 figs. (London: Constable & Co., Ltd. 1931. 21*s.* net.)

This book, which is profusely illustrated, and well supplied with plans, diagrams and tables, deals with reclamation of land from the sea for all purposes and not merely for agricultural development. It contains copious references to existing publications on this and allied subjects, and gives examples of the several types of reclamation work. Reclamation of small areas of land from the sea is incidental to schemes of river training and straightening, either by hastening the rate of accretion behind training walls, or by the dumping of materials dredged from the river channels. To the extent to which this type of reclamation is applicable, the book is of interest to drainage authorities, particularly the Catchment Area Boards, now being constituted under the Land Drainage Act, 1930, with estuarial problems to solve.

As the author indicates, reclamation from the sea for agricultural purposes is not an economic proposition to-day. He enlarges, however, on the advantages of its application to industrial and harbour developments, and for the disposal of factory wastes, trade and house refuse, etc. It is, by the way, not a little remarkable that no mention is made of the value of *Spartina*, or Rice Grass, in relation to the reclamation of maritime muds, and even settled saltings. A chapter on plant life in relation to reclamation work might usefully be included in a future edition.

Agricultural Engineering. By J. B. Davidson. Pp. vi+396. Illustrated. (New York: John Wiley & Sons. London: Chapman & Hall. Price 17*s.* 6*d.* net.)

Mr. Davidson, who is Professor of Agricultural Engineering at the Iowa State College, has contributed this volume to the Wiley Agricultural Engineering Series, of which he is the editor. The object which he set himself was not the provision of a technical treatise on agricultural engineering, but of a text book for the use of those who teach the subject of agricultural machinery. The book opens with the consideration of the relation of agricultural machinery to agricultural progress, and the early chapters are devoted to the main principles of machines in general and of agricultural machinery in particular; one whole chapter is reserved for the all-important subjects of friction,

and lubrication. In dealing with the various classes of machinery used on the farm the author has resisted the temptation to describe all types of the various machines that may be found: he states in his preface that "A careful selection has been made of the more important machines in general use in the United States and it is believed that a study of these will be helpful in understanding, operating and managing others." The various classes of machinery are succinctly described and the historical notes add to the value of the descriptions. The book is well and profusely illustrated. Although it deals with machinery and conditions in the United States it cannot fail to attract the interest of all teachers in the subject of agricultural machinery in this country.

The Pig Breeders' Annual, 1931. Vol. XI. Pp. 200. (London: National Pig Breeders' Association, 92 Gower Street, W.C. 1. Price 2*s.* 6*d.*)

A wide range of subjects is dealt with in this annual, which contains articles by experts on breeding, feeding, judging, costs, marketing and management, as well as tabular matter and other information of a practical and up-to-date character. Sir Ralph Jackson, Chief Veterinary Officer to the Ministry, contributes a preface, and there are some 40 well-chosen illustrations in addition to diagrams and charts. Of special interest is the interim report on the "Dentition of Pigs as an Indication of Age," presented by the Association's Veterinary Inspectors, and embodying a suggested amendment to the existing standard for swine six months old. Practically every aspect of the industry finds a place in this publication, which should be in the hands of all who are concerned with pigs.

The Journal of the Wiltshire Association of Dairy Students. Vol. III, No. 1. (Obtainable from the Agricultural Organizer, Polebarn House, Trowbridge. Price 3*d.*)

The subjects covered by this journal are very varied, including "Grass as a Foodstuff," "The Warble Fly," "A Forestry Tour," "Hand Milking," "Mastitis," "Pullets for Laying Tests," "Farm Book-keeping," "The Wiltshire Bacon Pig," and "Selection of Breeding Stock." Of special importance is the report of last year's operation of the Wiltshire Pig-Management Competition, an educational venture that is being watched by pig-breeders with keen interest.

Insects and Climate. By B. P. Uvarov. Transactions of the Entomological Society of London. Vol. LXXIX, Part I. (Published by the Society at 41 Queen's Gate, London, S.W. 7. Price £1 1*s.*)

One of the greatest difficulties encountered by the scientific worker of the present day is that of keeping abreast of discoveries that are being made in different parts of the world. Such discoveries are recorded in so many different languages and in such a multitude of different transactions, journals, or other publications, that the research worker must either spend a large proportion of his time in reading or pursue his investigations in ignorance of what is being, or what has been, done in the same line elsewhere. This difficulty can to a considerable extent be overcome by the publication of carefully prepared surveys of the different scientific fields, and of such a survey the work under review is an admirable instance.

Mr. Uvarov, in some 250 pages, has summarized the contents of well over a thousand different scientific papers and books—which will sufficiently indicate the immensity of the task he has accomplished. The survey is divided into two sections, the first being devoted to the

effects of temperature, humidity, light, and other physical factors upon insects, and the second to the correlation of definite weather conditions with various insect activities. The effect of low temperatures on insects, the influence of wind on the dispersal of insects, questions relating to climate and insect-borne diseases (malaria, etc.), the forecasting of the outbreaks of insect pests, and the utilization of climatic factors in controlling such pests are among the important subjects discussed.

From the agricultural point of view, the ultimate object of the study may be gathered from the following statement in the introduction: "Economic entomologists of the present day are no longer satisfied with merely recording the outbreaks of insect pests and with devising means for their control. They realize more and more that their chief aim and highest ambition must be to foresee and to prevent outbreaks." This ideal is one with which all readers of this JOURNAL will cordially sympathize; time must elapse before practical results can be achieved, but it is well to realize that such fundamental and often complex investigations as are recorded by Mr. Uvarov have a practical object in view.

Scientists, whether entomologists or others concerned with the relationship of climate and weather to agriculture, will owe a debt of gratitude both to Mr. Uvarov for his painstaking work and to the Dietetics Committee of the Committee of Civil Research, the Empire Marketing Board, and the Entomological Society of London for the assistance which has rendered its publication possible.

Agricultural Progress. Vol. VIII, 1931. Pp. 169. (London: Ernest Benn, Ltd., Bouverie House, E.C. 4. Price 5s. net.)

In this annual publication are collected abridgements of papers read at meetings connected with the Agricultural Education Association, information regarding recent activities in the various branches of the industry, book reviews, notes and personalia. The present issue opens with a symposium on "Recent Progress in Poultry Husbandry," being articles contributed by Mr. P. A. Francis, Poultry Commissioner for England and Wales, Professor R. T. Parkhurst, Director of the National Institute of Poultry Husbandry, Messrs. E. T. Halnan (Cambridge), J. H. Prentice (Hillsborough) and other well-known specialists. Then follow sections on Agronomy, Animal Husbandry, Dairying and Education, each containing papers that will be found of value by those who desire reliable information regarding the latest developments in agricultural practice.

Classified List of Daffodil Names: with particulars of the Society's Classification of Daffodils and arrangements for the registration of Daffodil names. Pp. 189. (London: The Royal Horticultural Society, Vincent Square, S.W. Price 1*s.* net.)

In bringing up to date the list of Daffodil names registered with the Royal Horticultural Society, further additions are made to the list of over 5,000 names, published in 1929. The additional names include over 900 varieties registered during the last two years, together with a number registered in New Zealand. As in the last edition, a numeral and letter preceding each name indicate its position in the accepted classification; the name of the raiser and the approximate age of the variety are also given. In the new edition the name of the person or firm who registered the variety is recorded, and the names of varieties now lost to cultivation or surpassed are inserted in small type in the general list. This comprehensive list should be acquired by all who are engaged in daffodil culture; and it is almost essential that it should be consulted before a new daffodil name is submitted for registration.

Elements of Practical Statistics. By F. H. Harper. Pp. xix+324. (London: Macmillan & Co., Ltd. New York: Macmillan Co. 1930. Price 10*s.* 6*d.*)

This book has been planned to explain the general principles of statistical methods as simply and as concisely as possible for the benefit of the student and the research worker who have received no special training in the science of mathematics and the theory of statistics. That there is a need for such a work in undoubted; the statistical method of research is widening its scope, and statistical data from State, commercial and scientific sources are increasing rapidly. The satisfactory interpretation of this material cannot be deduced without a working knowledge of the technique of the statistical method.

The author has had the assistance of Dr. Kemp, the Assistant Dean of the College of Agriculture, Maryland, in preparing this book, and, in consequence, all the chapters, from Sampling, Tabulation and Graphic Presentation to Correlation and Index Numbers, are given an added interest to agricultural workers, as the examples of statistical technique are largely drawn from agricultural data.

The book is provided with a useful series of appendices; Logarithm Tables, Ordinates of the Probability Curve, and Table of Squares and Cumulative Summations among others.

Environment and Plant Development. By Dr. Henrik Lundegårdh. Pp. 330. 95 Illustrations. (London: Edward Arnold & Co., 1931. Price 24*s.*)

This book is a translation from the German, by Mr. Eric Ashby, of the second edition of Lundegårdh's well-known "*Klima und Boden in ihrer Wirkung auf das Pflanzenleben.*" The work is essentially an attempt to apply physiological facts and methods to plant ecology. Without denying the probability of great developments in the future from experimental ecology, it remains a matter of doubt whether laboratory physiology will supply ideal methods. The more interesting parts of this book deal with experiments conducted in the field under at least more natural conditions than are usually found in laboratories. The subjects dealt with are: light, temperature, water, the ecological, physical, and chemical properties of the soil, soil micro-organisms, the carbon dioxide factor, and principles of experimental ecology. The book has as illustrations eight plates and 87 text-figures (including diagrams and graphs), and contains a long bibliography, an author index, and a subject index.

Progress in English Farming Systems.—V. A Pioneer of Progress in Farm Management. By C. S. Orwin. Agricultural Economics Research Institute, Oxford. (Oxford: The Clarendon Press. Price 1*s.* 6*d.* net.)

This monograph deals with Mr. A. J. Hosier's holdings at Wexcombe and Collingbourne in Wiltshire, where open-air dairying on a large scale has now been carried on for several years, the cows being in pasture the whole year round. Mr. Hosier's system of dairy farming and down land improvement has been discussed by various writers, but to those who desire a detailed description, Mr. Orwin's pamphlet should prove of great interest.

Mr. Hosier's Wexcombe Farm estate is approximately 700 to 800 feet above sea level, and his system of treatment of the down land here consists of (1) a thorough trampling or consolidation of the ground with direct manuring by the cattle; and (2) frequent harrowing after the stock has been removed from the particular pasture, and the sowing of the finer varieties of grasses and white clover.

In 1922, the condition of the down land for grazing was practically valueless as it consisted chiefly of heather and poor grass. During that year, Mr. Hosier started his system of grassland improvement by introducing his novel portable milking bails, which are drawn over the down systematically, the cows being corralled at the bails during milking operations. This results in a thorough trampling of the ground, together with direct and heavy applications of manure, both liquid and solid.

By 1925, it was easy to pick out the boundary line of Mr. Hosier's estate, as by then a great improvement of the down land, subjected to this treatment, had taken place. This system has led to the complete disappearance of heather and other scrub; so that to-day can be seen acre after acre of closely grazed grass on which, in March of this year, a young bite was already showing.

Walking over the downs to-day and comparing them with the condition seen in 1925, the improvement shown is as great, if not greater, than the improvement which took place between 1922 and 1925.

Five Years' Work at the Hertfordshire County Egg-Laying Trials. By D. W. Ferguson, N.D.P. (Hons.). (St. Albans: Hertfordshire Institute of Agriculture, Oaklands.)

This interesting report gives detailed information regarding the feeding and health of the birds, their egg-yield and its value, methods of management, and the system of scoring adopted. The trials are open to all poultry-keepers in the county. During the period under review, the number of birds has increased from 147 to 210. Three meals a day are given, the first at 7 a.m. consisting of ½ oz. of grain per bird. At 11 a.m. wet mash is fed, and, with the dry mash from the hoppers, averages 2½ oz. per bird daily. The mash mixture is composed of one part of bran, 4 of middlings, one Sussex ground oats, 3 maize meal and 1½ fishmeal. In the evening each bird receives 1½ oz. of grain, composed of 2 parts wheat and one broken maize. Out of 921 birds 43 have died, the majority of these deaths being due to ovarian disorders and tumours. Both for numbers and value of eggs, the White Leghorn has shown itself to be the best layer. The White Wyandotte is noted for a good winter output. During the five years under notice, the annual value of the eggs sold has averaged 17s. 4d. per bird in excess of the cost of food. The report is clearly written and contains a number of statistical tables and graphs. Copies can be obtained from the Principal at the Institute, Oaklands, St. Albans.

The Woad Plant and Its Dye. By (the late) Jamieson B. Hurry, M.A., M.D. Pp. xxv.+328. Illustrated. (Oxford: University Press; London: Humphrey Milford. 1930. Price 21s. net.)

Woad no longer plays an important part either in the farming or in the commerce of England or of Europe. This was not always so. Before the advent of indigo from India and the East, woad was one of the most valuable of the sources of dye in the West; and, since the most popular colours for clothing stuffs were blue and black, it was the most generally used of the vegetable dye-stuffs.

Dr. Hurry traces the rise and decline of the cultivation and manufacture of the plant and its product, describing in detail the preparation of the soil, the sowing of the seed and the care of the crop during its period of growth. Thence, he passes on to the gathering of the harvest and the treatment of the raw material for making the dye. The various districts in Western Europe, where this industry was fully developed, are described; also the part it played in the lives of the people. Particulars of the methods of marketing the finished product, and its

utilization by dyers and clothiers, also find a place in this comprehensive work.

It was, perhaps, inevitable that the author should have depended mainly upon secondary authorities for his sources of information. Although this is not always satisfactory from an historian's point of view, in an eclectic treatise of this kind it has every excuse. The wide ramifications of the trade in the dye, and the dispersed geographical positions of the districts in which the plant was grown, almost compel the adoption of this method for a history of woad, the usage of which was so formalized that, except in regulatory and similar enactments, there is little contemporary reference to it.

The treatment of the subject is carefully planned and the book tells a complete story. Most of us incline to think of woad as confined to the body decoration of the ancient Britons, and it is useful, therefore, to have this book to make plain the great importance of the plant and the dye, the widespread use of which only began to decline in the seventeenth century. Such a work, moreover, is of great value in enabling us to construct a picture of the lives of our forefathers.

Field Experiments in Horticulture. By T. M. Hoblyn, Dip. Hort. Pp. 50. Technical Communication No. 2 of the Imperial Bureau of Fruit Production, East Malling, Kent, England. 1931. Price 2s. net.

The art of field experimentation had made such rapid advance during the last decade as to give the research worker an entirely new outlook on the possibilities of research in the field. Mr. Hoblyn has, during recent years, been applying the statistical method to the lay-out of fruit experiments at the East Malling Research Station, and this bulletin is the outcome of a session at the Imperial Horticultural Conference last year, at which horticulturists, from all parts of the Empire, discussed problems connected with the lay-out of horticultural experiments in the field.

Early difficulties in drawing correct conclusions from field experiments were largely due to variation inherent in the trees (stock influence, for example) and to variation due to external causes. In order to eliminate false deductions from these causes, standardization of material and careful lay-out is essential. Methods comprising "randomization," as devised by Dr. R. A. Fisher, are described, and the advantages and disadvanatges of systematic and random arrangements are discussed.

Minute, accurate observations of the behaviour of individual trees are no less important to the horticultural worker than accurate trap-nesting to the poultry breeder, or milk yields to the progressive dairy farmer. In order to interpret correctly the cropping of the trees, the research worker must study their individuality and make careful records of their vigour and productivity. The technique and methods employed at East Malling are described and illustrated, including the system of telephoning measurements of twigs from the orchard to the office, of using secateurs fitted with an automatic counter, and the "counting picking bag."

Finally, examples of three horticultural field trials, carried out at East Malling, are described, and the method of analysing the results and deducing their significance is explained. The book will be of much interest to all thoughtful horticulturists, and is of essential importance to all research workers engaged in field experimentation.

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NOTES FOR THE MONTH

ADJUSTMENT to meet the situation created by low prices and high costs continues to be the outstanding problem with which farmers are at present faced. Whatever may be the main cause or causes of agricultural depression, in seeking a remedy farmers must primarily look to reduced costs of production and particularly of distribution. In a recent paper on the economic outlook for agriculture in the United States, Dr. Warren (Cornell) states that if the trouble is over-production the charge that extension work and scientific research are to blame may have a grain of truth in it, but if, as he himself contends, the trouble is mainly monetary, and if we must learn to produce at a profit with prices at pre-war levels and wages far above pre-war, then there was never before a time when research and education should be pushed with more vigour. Farmers must know how to adjust and act quickly. The use of improved machinery and greater output per man are the chief means by which the depression can be met.

Reducing Costs

Dr. Warren anticipates still lower prices except for products that are already below the general price level. He counsels the American farmer neither to buy land nor to work land that does not give a high output per hour of labour. The farmer should have a business large enough to employ, fully, all his time and that of his employees. He must get more bushels of grain and more pounds of milk per unit of labour. The higher crop yields should be obtained by dropping out of use the fields that do not give high yields. Such fields may be used for pasture. The fields that are used for cultivated crops should be well fertilized and well cared for. Fertilizers are cheap, but wages are high. More care in using good seed, attention to disease control and the like are essential. Such changes mean more production per man.

Occasionally, Dr. Warren points out, as in Western Kansas, a region of low yields can be used because a new machine comes

in and makes the output per man very high with low yields. Even here, however, high yields for the region are very important. Labour may be made more efficient by the use of machinery, but labour-saving plans are often the more important consideration. Methods of doing work at the time, and in the manner, that make an hour count for the most are of unusual value.

The discrepancy between producers' prices and consumers' prices is, he considers, particularly severe on agriculture because the farmer, as a rule, buys retail and sells wholesale. It is, therefore, all-important that farmers should attempt to get nearer to consumers and to wholesalers when, respectively, selling and buying.

When in the past nearly all the time of human beings was spent in obtaining bare necessities, quality of food was not very important, but decade after decade as the proportion of income that goes for food is reduced, the increased buying power is in part spent on choicer foods. Even in the general depression that prevails there is a demand for quality.

Finally, Dr. Warren pleads that agricultural colleges should take an active part in studying distribution. The colleges were originally biological institutions. When farming was a home industry the problems of production were the primary ones. The rising price level, from 1900 to 1920, also made production particularly important. Now the subjects of Farm Management, Marketing, Prices, Accounting, and Public Affairs are as important as production.

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Bramley's Seedling Apples Wanted

THE Department of Scientific and Industrial Research is inviting tenders for the supply of 140 tons of Bramley's Seedling apples in minimum quantities of 15 tons, to be gathered and delivered to the Department's Ditton Laboratory at times to be arranged. The fruit must be of a minimum size of 2½ in. and be free from bruising or other blemish likely to affect its keeping qualities. Orchard boxes will be supplied by the Department. Tenders, addressed to the Engineer-in-charge, Ditton Laboratory, East Malling, near Maidstone, Kent, must be delivered not later than Monday, September 14, 1931.

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The British Sugar Industry (Assistance) Act, 1931

THIS Act received the Royal Assent on July 31, 1931. It provides for payment of a special advance of 1*s.* 3*d.* per cwt. on 300,000 cwt. of sugar per factory manufactured during the 1931-32 season from beet grown in Great Britain. Twelve factories are concerned. The special advance is made conditional on a firm price being offered by the factories to the growers, that would give the latter the full equivalent of the advance. The advance at the full rate of 1*s.* 3*d.* is to be made only when the average price of raw cane-sugar, c.i.f. United Kingdom, prompt shipment, in the two weeks preceding the week in which the sugar is manufactured, is 6*s.* 6*d.* a cwt. or below, the rate being diminished by one penny for each penny by which the price of raw cane-sugar rises above 6*s.* 6*d.* up to 7*s.* 9*d.*, when payment ceases. The advance is repayable under certain conditions by deduction from the subsidy payments that will fall due in the two succeeding manufacturing seasons.

The circumstances leading to the granting of the special advance are discussed in detail in the *Report on the Sugar-Beet Industry at Home and Abroad.** The Prime Minister's statement announcing the Government's proposals was given in this JOURNAL for March last.†

* * * * * *

Royal Agricultural Museum of Egypt.

ON his return from a recent visit to the Royal Agricultural Museum at Budapest, Hungary, King Fuad I. of Egypt expressed the desire that a similar institution might be established in his own country. Accordingly M. Alajos de Paikert, director of the Hungarian Museum, was invited by the Egyptian Government to direct the organization of a new museum which has been located in the Palace lately purchased from the heirs of H.H. Princess Fatma Hanem. The object of the museum is to demonstrate in a scientific and practical manner the importance, development and possibilities of the various branches of native agriculture, and to provide a permanent exhibition of such products as may interest agriculturists, as well as foreign merchants and business men in Egypt.

Material collected from the Millennial Exhibition of 1896 formed the original nucleus of the Museum in Budapest, and the

* Economic Series No. 27, H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 6*d.* net, post free 1*s.*

† Vol. XXXVII, No. 12, March, 1931, pages 1167-8.

Agricultural Exhibition which was held early this year at Geziret, Cairo, has provided a similar nucleus for permanent exhibition in the new Egyptian Museum. In addition to collections representative of every branch of the native agriculture, the museum will comprise up-to-date laboratories, a library of agricultural books and periodicals open to the public, and an information bureau for farmers, merchants and others interested in agriculture. Gifts of suitable publications, models of agricultural inventions, samples of high-grade crops, maps, plans and models of historical importance, new adaptations in agricultural implements and machinery, and other objects connected with agriculture, will be gratefully received and may be addressed to the Minister of Agriculture, Cairo, or to the Director, Royal Agricultural Museum, Dokky, Giza, Egypt.

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International Dairy Congress, 1931

THE Ninth International Dairy Congress, which was attended by official representatives from 41 countries, was opened by H.M. the King of Denmark in the Town Hall of Copenhagen on July 13 last, in the presence of a large assembly. The ceremony concluded with an interesting and illuminating address by Th. Madsen Mygdal (a former Prime Minister) on "Danish Agriculture, with Special Reference to Dairying."

The mornings of July 14 to 17 were devoted to paper reading at the five sectional meetings, delegates attending those sections in which they were most interested. Arrangements were made for the afternoons to be given up to tours in the vicinity of Copenhagen, this enabling delegates to obtain some idea of Danish methods of farming, agricultural education and co-operation.

At the conclusion of the Conference a number of tours were organized. These tours gave to those participating an opportunity of seeing Danish farming methods at first hand, and of learning how the Danish farmer combines intensive arable dairying with pig production. Co-operative dairy and bacon factories, as well as co-operative export associations, were included in the itinerary, so that the delegates had ample opportunity of studying the system of co-operation that has been built up in Denmark. Visits were also paid to the Agricultural and Dairy Colleges. Students before admission to the Colleges must have had at least four years' practical experience, either on a farm or in a dairy, the courses at

these Institutes being principally of a theoretical nature. It is interesting to note that 98 per cent. of the students who attend return to farms.

The organizers of the Conference are to be congratulated on the efficient arrangements for the Congress, both in Copenhagen and on the tours that followed.

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THE following note has been communicated by Mr. Arthur Canham, Secretary of the British National Union.*

South African Farmers' Tour of Great Britain

Under the ægis of the British National Union, which was founded by the late Sir Pieter Stewart-Bam in 1925, another successful tour of Empire Farmers has just been completed. On this occasion the members were almost exclusively South African. They were 30 in number, representative of every Province of the Union and of Rhodesia; and their interests covered a wide range of activities, from general and stock farming to wattle, fruit and sugar production. There was an unusually large number of young farmers in the party, which also included many Dutch-speaking representatives of South African agriculture. The tour covered a period of two full months, during which the party travelled by motor coach some 3,500 miles, exclusive of journeys by motor cars that were placed at their service at different points by local farmers—who, as is usual on such occasions, did everything possible to welcome the visitors and to make them feel at home. Experience has shown that no one more readily responds to courtesy of this kind than do farmers from South Africa, and one and all of the tourists are taking back with them favourable impressions not only of the high standard of British agriculture in all its varied forms, but of the kindness and goodwill that the people of this country bear to those of other parts of the Empire. It is to the personal contact and friendship which these visits create that the British National Union attach the greatest value, and no greater success has been attained in these directions than on the present occasion.

Leaving London after a week's stay, the party commenced their agricultural tour by visiting Rothamsted, in recognition of the century-old work carried on at this famous

* Mr. Canham, formerly Trade Commissioner in London for the Union of South Africa, accompanied the party throughout the tour and was responsible for the tour arrangements.

institution. At Cambridge, they not only saw some of the results that the application of science has brought about in all branches of production, but they met some of the workers whose researches have given them a world-wide reputation. A delightful day was spent with Captain Pretyman and his fine cattle at Orwell Park. In the Fens of Cambridge and the Marshes of Lincolnshire they saw cultivation and crops the quality of which astonished them, and the beautifully cultivated lands of these two English counties—the elimination of waste ground, the efficient systems of drainage and the character of farm organization generally—quite captivated the visitors. The Lothians of Scotland also provided some excellent samples of British farming at its best.

The stock of the country, naturally, was an object in which the visitors took much interest. South Africa is essentially a stock country, and in respect of cattle seems to be gradually advancing to a stage when it will become a great meat-exporting country. Herds of almost every type of cattle were inspected, and not only were these seen under ordinary farm conditions, but at the Royal and the Highland Shows the visitors had the opportunity of seeing many outstanding specimens of their kind. As regards sheep, South Africans are mainly interested in the production of wool, for which the small-bodied Merino, with its wealth of fine wool, is mostly used. At many sheep farms the owners found in their visitors keen critics of the quality of wool produced, but very general admiration was expressed for the sheep themselves. The rich pastures of Romney Marsh and the huge flocks in the fields proved of great interest, and when later at Wye College the visitors heard of what was being done to combat the diseases amongst the sheep of the district—diseases, in some respects, not dissimilar to those in their own country—they felt that, at any rate, they would be able to take back with them something of practical use to their fellow farmers in the Union.

The party visited quite a number of Agricultural Research and Experimental Stations, and they listened with rapt attention to the addresses given by scientific workers at these places, and gained much useful information that will be turned to good purpose on their return.

At Bradford the wool section of the party was much impressed by the Research Institute so ably presided over by Dr. Barker, whose recent visit to South Africa has afforded him a full knowledge of conditions in that country. At this

institution, problems of vital importance to the wool industry are being investigated, both on the production and on the manufacturing side, and one and all felt it a great privilege to be admitted, even to a slight extent, into the confidence of such an able and enthusiastic worker.

Apart from agriculture, there were many features of the tour programme that afforded the visitors both pleasure and satisfaction. Nothing could have exceeded the warmth of welcome extended to them by everyone they met. British farmers, either individually or as members of the National Farmers' Union, offered their services freely, and in the true spirit of Empire assisted in making the visit to their district as pleasant and useful as possible. What especially pleased the party were the opportunities afforded of visiting some of " the stately homes of England," so rich in artistic treasures and enshrining within their walls so much of the past history of the country. In many instances the noble owners of these houses themselves were present to receive the party, a courtesy which was very much appreciated.

Taking the tour as a whole, the British National Union are well satisfied with the results. It provided pleasure and education to those taking part, but, above all, it affirmed the essential unity of our people. The visitors are taking back the best possible impressions of both our land and people, and the knowledge gained and the friendships formed cannot fail to have the best possible effect on Empire relations generally.

* * * * * *

THE following note has been communicated by the National Institute of Agricultural Botany :—

Varieties of Cereals for Autumn Sowing

There can never have been more need than now for the arable farmer to know which varieties of cereals will give him the best yields and the best prices. It is no time for the individual to risk his money on untested novelties, and fortunately it is unnecessary. The work of the National Institute of Agricultural Botany in co-operation with Agricultural Colleges and Stations and County Agricultural Organizers provides the means of sorting good varieties from bad and finds the environments which suits each best. Different varieties serve different purposes ; no one variety can meet the varying demands that are made in the

case, for instance, of the wheat crop; but there are still far too many varieties on offer, and, as the difference in the returns of the good and the bad may be 20 per cent., some drastic weeding is required. The knowledge is available, but only the farmer can put it into practice.

The Institute may fairly claim an extensive knowledge of all varieties of cereals of any importance that are likely to be on the market in the coming season. Among the newer of these, as well as among the numerous varieties that have yet to pass their tests before reaching the market, there are several that show promise in one or more respects. The only varieties, however, that can at present be recommended are given in the following paragraphs.

Winter Wheat.—Wilhelmina and Victor are the most reliable high-yielding varieties on soils in good condition; Yeoman and Yeoman II possess unique bread-making quality and are the varieties to grow on the richest soils or under intensive manuring; Little Joss should be chosen for the lighter wheat soils, particularly in Norfolk, or where fertility is low; Iron III, though less reliable than Wilhelmina and apt to develop rust, finds a place, like Weibull's Standard, on heavy soils. Rivett, or Blue Cone, probably outyields all other varieties on heavy soils in the South of England, and Square-head's Master stands by itself in its adaptability to all sorts of conditions and the regularity with which it gives a respectable crop.

Winter Oats.—Grey Winter is unequalled in winter-hardiness, and in quality of grain, but its straw, though excellent for feeding, stands badly. Farmers who sow oats in the autumn, particularly on light soils, should use this in preference to any other variety. Those who prefer a black oat may expect nearly as good results from Black Winter. Bountiful used to be recommended for its stronger straw, in spite of its greater susceptibility to frost: such stocks, however, as have come to the Institute's notice in the last two seasons under the name of Bountiful have been about half Black Winter. This no doubt is due to the action of the 1929 frosts on stocks that contained a negligible proportion of Black Winter plants. Farmers who want Bountiful for the sake of its strong straw will be well advised to obtain a guarantee that the seed is substantially true to type.

Winter Barley.—Farmers who are content with feeding quality grain are safe with ordinary six-row barley: it is winter-hardy and crops well. In sheltered situations and on well-

drained soils it is often worth while to risk sowing the two-rowed spring varieties, Plumage-Archer and Spratt-Archer. Successful crops not only yield heavily but generally realize top malting prices.

Fuller information about these varieties is given in N.I.A.B. Farmers' Leaflet No. 1, obtainable from any County Agricultural Organizer or direct from the Institute at Huntingdon Road, Cambridge. Reports can also be had through the same channels on almost any other variety, new or old. Points of a general character that all farmers would do well to bear in mind are that all the wheats now on sale are sufficiently hardy for the normal English winter: synonyms, *i.e.*, old varieties under new names, should be avoided; there is no definite evidence that Continental-grown stocks will give better results than stocks of the same variety grown in England, provided the seed is of equal purity and germination; and germination can be tested for a nominal fee at the Official Seed Testing Station, Cambridge—a very necessary precaution after the bad harvest conditions of the last two years.

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Imperial Agricultural Bureaux Journals

IN the last issue of this JOURNAL appeared a note on the subject of the issue of a new journal, entitled *Nutrition Abstracts and Reviews*, under the auspices of the Imperial Agricultural Bureaux Council, the Medical Research Council and the Reid Library. The need for the regular issue of abstracts or extended titles of current research literature has also arisen in the other fields with which the Imperial Agricultural Bureaux are concerned.

The Imperial Agricultural Research Conference, upon whose recommendation the Bureaux were established, suggested that the Bureau of Animal Health, when organized, should incorporate the veterinary activities of the existing Bureau of Hygiene and Tropical Diseases. Among these activities was the publication of a quarterly journal entitled the *Tropical Veterinary Bulletin*, and arrangements were accordingly made with the Bureau whereby the *Tropical Veterinary Bulletin* ceased publication with the number for December, 1930, and the first number of the *Veterinary Bulletin* appeared in its place on April 1, 1931. The second number followed on July 1. The new publication deals with all aspects of animal health, in so far as they relate to original research and administrative

control. The ground covered by its predecessor is included, and in addition the diseases of temperate climates are given full consideration. Two further numbers will be issued on October 1 and December 1 respectively, completing the four parts of Volume I (about 384 pages). The subscription is £1 or 7*s.* 6*d.* a copy, payable in advance, post free to any part of the world. From January 1, 1932, the journal will be published monthly, and the volume will run to about 600 pages, including the index.

Before these arrangements were completed, demands had arisen for similar journals from workers in other branches of science, and this led the Council of the Bureaux to consider the practicability of issuing other journals forthwith. The pioneer in the field with a regular journal was the Bureau of Animal Genetics, which issued the first number of its Quarterly Bulletin in December, 1929. The Bulletin is not specifically an abstracting journal, but abstracts of current literature and reviews of books are a feature of each issue. Besides thus calling attention to published work of importance the Bulletin has included notes on matters of interest arising from the Bureau's correspondence and reviews of special subjects such as " Fur Production " and " Lethal Factors and Live Stock Breeding."

The Bureau of Plant Genetics (for crops other than herbage) was the first Bureau to issue an abstracting journal pure and simple. *Plant Breeding Abstracts* is issued quarterly, and Vol. I, No. 3, which was published on April 1, 1931, contains 197 references covering 52 pages. All the more important publications having reference to plant breeding and the genetics of crop plants are dealt with, the references being classified according to subject, while each reference is followed by an abstract giving the subject matter and the conclusions reached. The papers are divided into two classes, those published in the British Empire and in foreign countries respectively. Papers in foreign languages are usually abstracted more fully than those in English. The annual subscription for *Plant Breeding Abstracts* is at present 5*s.* post free, single copies being obtainable at the price of 1*s.* 6*d.* Subscriptions should be sent to the Deputy Director, Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, England.

The Bureau of Fruit Production commenced the publication of *Horticultural Abstracts* in May, 1931, the first number dealing with the quarter, January–March. Publication will be quarterly, and the subscription is 5*s.* per volume of four

parts, post free. Single copies may be obtained at the price of 1*s.* 6*d.* Subscriptions should be sent to the Chief Officer, Imperial Bureau of Fruit Production, East Malling Research Station, East Malling, Kent. All the more important horticultural literature is covered, special emphasis being attached to fruit production, cold storage and allied subjects.

Horticultural Abstracts was followed very closely by *Herbage Abstracts* from the Bureau of Plant Genetics (Herbage Plants), the first number of which is dated June, 1931. *Herbage Abstracts* deals with herbage and certain forage crops, not only from the point of view of the plant breeder, but also from that of the agronomist. Besides abstracts of papers, each number will contain a section of miscellaneous notes, short extracts from official reports, and proceedings of conferences that might be of value to the worker on herbage and forage crops and general grass land. At present the majority of the papers and reports abstracted deal with the more temperate regions, but as the study of tropical grass lands and forage crops develops, it should be possible to supply more information. The subscription for *Herbage Abstracts* is 4*s.* for 1931 (three issues only), and 5*s.* per annum thereafter. Single copies may be obtained at the price of 1*s.* 6*d.* Subscriptions should be sent to the Chief Officer, Imperial Bureau of Plant Genetics, Agricultural Buildings, Aberystwyth, Wales.

The Bureau of Soil Science began the issue in May, 1931, of lists of publications relating to soils and fertilizers. The first list covered the period January–April, 1931, and future lists will be issued at about monthly intervals. The price is 10*s.* per volume, and subscriptions should be sent to the Deputy Director, Imperial Bureau of Soil Science, Rothamsted Experimental Station, Harpenden, Herts. These lists do not claim the status of an abstracting journal, but an abstract of two or three lines appears below each entry.

In the case of the Bureau of Agricultural Parasitology, arrangements have been made for the *Journal of Helminthology*, of which the Director of the Bureau is the editor, to include a supplement giving titles, reviews and abstracts of papers and literature.

The facts stated above indicate that the regular issue of abstracts or extended titles has been assured by each of the eight Bureaux, and it is undoubtedly one of the most valuable methods by which they can fulfil their function of acting as clearing-houses of information in their respective fields.

The following has been communicated by Mr. A. W. Oldershaw, B.Sc., Agricultural Organizer for East Suffolk :—

Grass Mixtures

The very low prices prevailing for corn render it probable that next spring will see large areas of land sown down to temporary or permanent grass. This is deplorable from a national point of view, but if the unprofitableness of corn-growing renders it necessary, it is very important that it shall be done in the best possible way. There is very little doubt that the chances of success are greatly increased if the covering cereal crop is suitably manured. A heavy dressing of nitrogenous manure applied to the corn has been shown, both at Saxmundham in Suffolk, and Sprowston in Norfolk, to be definitely harmful to the young seeds. On the other hand, phosphatic manure applied before sowing the grass and clover seeds will usually greatly benefit them. This is especially marked on heavy soils. On certain lighter soils, as at Sprowston, it has been found that the "seeds" crop greatly benefits by the inclusion of potash in the manure. On the whole, for heavy soils 4 cwt. of superphosphate or 6 cwt. of basic slag per acre will answer the purpose, whilst on lighter soils 2 cwt. of superphosphate and 1 cwt. of muriate of potash will be found useful. Where some outlay on fertilizers can be afforded it will generally prove to be money well spent.

There is also the very important question of a suitable mixture of seeds. There would appear to be very good reason for believing that the practice which prevailed thirty years ago of sowing complicated and expensive mixtures of grass and clover seeds is quite unnecessary. The question of the value of indigenous strains of natural grasses is at present being studied at Aberystwyth and elsewhere, and is of great importance.

Considering the matter from the point of view of the farmer anxious to obtain the best possible results with the least possible expenditure, several points of great importance have become evident from some plots put down at Saxmundham. Some of these were laid down as long ago as 1903.

Of the plots then put down, a mixture recommended by the late Mr. R. H. Elliot, of Clifton Park, Kelso, proved capable of growing better crops than the other mixtures. The superiority of Elliot's mixture was especially evident when all plots were very much under-manured. This mixture included the deep-rooting plants, chicory, burnet and yarrow. Elliot's idea of including deep-rooting plants seems sound, especially in districts of low rainfall and on light soils. The low level of

productivity of most of our grass land in 1929 is evidence of the desirability of including deep-rooting plants.

Chicory especially, however, is not a desirable ingredient in a hay mixture, and there seems very good reason for believing that lucerne is a far better deep-rooting plant to include than chicory, burnet, or yarrow.

In 1926 another series of grass mixture plots was put down at Saxmundham. These have been regularly mown for the past four years and their produce weighed. Very heavy crops of red clover were obtained in 1927, and this to some extent crowded out the wild white clover in 1928. The aftermath in succeeding years was well grazed, and the wild white clover is now very much in evidence where it was included in the mixture. One plot, however, had no wild white included and is strikingly inferior. Two of the mixtures included a proportion of lucerne. These have consistently yielded heavy crops and were the only plots that yielded a substantial aftermath in the dry year of 1929. Plots that received merely a good seeding of perennial rye-grass, late-flowering red clover, and wild white clover have done remarkably well, and now present a greener appearance than the others. They appear to be extremely well adapted for grazing, but in the wet season of 1930 the crop on these plots became badly laid—much more so than that on other plots which included the strong-growing cocksfoot and timothy.

Under certain conditions great benefit has resulted from the inoculation of lucerne seed with the culture originally prepared by Dr. Thornton of Rothamsted and now being sold commercially by Messrs. Allen & Hanbury, Bethnal Green, London, E.2. In one field on poor, light land at Tunstall, Suffolk, inoculation made the difference between a crop and no crop, the strips of inoculated crop being conspicuous at a considerable distance. In another field of rather better land, inoculation doubled the crop in the first year. In other instances no benefit has resulted—no doubt owing to the presence of an abundant supply of the requisite micro-organisms.

On light land there is good reason to believe that kidney vetch, trefoil, and red suckling clover (*Trifolium minus*) are valuable plants to include in a temporary mixture. The second and third species re-seed themselves from year to year to a considerable extent.

Summarizing, it would appear probable that there is no necessity to sow complicated mixtures of grass and clover for temporary grass.

The following mixture for mowing is based upon experience gained in trials on poor heavy land at Saxmundham Experimental Station :—

Per acre	
6 lb.	Late-flowering Red Clover.
1 ,,	Wild White Clover.
8 ,,	Lucerne (this should be inoculated if the land has not grown lucerne before).
10 ,,	Perennial Rye-grass.
4 ,,	Timothy.
29 lb.	

Cocksfoot and rough-stalked meadow grass may be included if desired. Cocksfoot helps the crop to stand up.

The land should receive generous applications of phosphates —superphosphate, basic slag or North African phosphates, and farmyard manure from time to time.

The following simple mixture has been found very satisfactory at Saxmundham for mowing the first year and grazing afterwards :—

Per acre	
24 lb.	Perennial Rye-grass.
6 ,,	Late-flowering Red Clover.
2 ,,	Wild White Clover.
32 lb.	

On medium soils containing sufficient lime, the following mixture is suggested for mowing :—

Per acre	
6 lb.	Late-flowering Red Clover.
1 ,,	Wild White Clover.
8 ,,	Lucerne (inoculated if land has not grown lucerne before).
10 ,,	Perennial Rye-grass.
4 ,,	Cocksfoot.
29 lb.	

Timothy may be included on heavier types of medium soil ; if the soil does not contain sufficient lime, it should be chalked or limed.

The land should receive phosphates and potash from time to time, also farmyard manure.

The following mixture based upon experience gained at Tunstall is suggested for very light land ; the land, if sour, *must* receive chalk or lime, or it is useless to sow this mixture :—

Per acre	
8 lb.	Lucerne.*
1 ,,	Wild White Clover.
2 ,,	Red Suckling Clover.
2 ,,	Trefoil.
4 ,,	Kidney Vetch.
6 ,,	Cocksfoot.
6 ,,	Perennial Rye-grass.
29 lb.	

Potash manures and farmyard manure will probably prove very beneficial on light land.

* * * * * *

Testing Agricultural Machinery

IN their first report† the Ministry's Agricultural Machinery Testing Committee reviews the work of the first five years of the operation of the scheme that they were appointed in June, 1925, to supervise. It was a pioneer period, in which entirely new and unexpected problems arose and called for solution, but the Committee are satisfied that "the scheme has now been established on a sound foundation, and that in all the circumstances it is making satisfactory progress."

The testing scheme and the steps that led to its inception are briefly described, and reference is made to schemes in operation in other countries. The scope of the scheme is discussed, and a number of interesting examples are given of the new problems thrown up in the course of the tests made under the Committee's direction.

The Committee point out that one of the difficulties they had to face was the absence of standards in respect of the machines tested, on which to base reports on their efficiency. The Committee will endeavour to set up a standard in any case when sufficient information becomes available, but they must be dependent for such information on research and testing work, and as they rightly point out "the fullest benefits of the scheme can only accrue when reports on machines of all important types are available in considerable numbers."

The Committee was set up to perform a function in connexion with the improvement of agricultural machinery. Their

* If the land has not grown lucerne before, or was sour before chalking or liming, it is *most important* that the lucerne seed should be inoculated. In general, a mixture that includes lucerne is better adapted for mowing than for grazing. Continuous defoliation quickly results in the elimination of lucerne.

† First Report of the Agricultural Machinery Testing Committee: H.M. Stationery Office, 1931, 3*s*. 6*d*. net.

work, through the reports that are now published and to be published, will provide information that cannot fail to be of value to farmers, manufacturers, research workers and agricultural instructors.

The Appendixes to the report include a reprint of the regulations governing the scheme, a statement of the fees now charged and of the fees that the Committee, in the light of their five years' experience, have recommended should be charged for testing. It may be added that these recommendations have been accepted by the Ministry. The pamphlet describing the scheme has, therefore, been revised and issued to the public.

The interesting feature of the report is an appendix in which are published together for the first time officially all the reports and certificates issued and available for publication by the Ministry.

Arrangements will be made in future for the publication of reports and certificates on individual tests of machines as soon as these documents are available.

* * * * * *

Agricultural Statistics, 1930 : Part One

THE Ministry's annual report on the acreage and production of crops and the number of livestock in England and Wales in 1930 has now been issued. The report contains information as to the acreage under the various crops, the number of livestock (including poultry), and the number of agricultural workers actually in employment on June 4, 1930, as returned by occupiers of agricultural land exceeding one acre in extent. Particulars are also given of the production of the more important crops, and estimates are made of the output of certain livestock products—including meat, milk, cheese, eggs and wool in 1929-30—as compared with previous years. The report also contains a table showing the estimated value of the agricultural and horticultural produce sold off farms in England and Wales during the agricultural years 1924-25 onwards. Other tables attached to the report contain detailed figures for each county in England and Wales of the acreage under each crop, the numbers of each class of livestock and the estimated yield per acre of the principal crops for the years 1930 and 1929, while summaries are also given for Great Britain and Ireland for the last ten years.

This report, entitled *Agricultural Statistics of England and Wales*, 1930, *Part I*, may be obtained through any bookseller or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1*s.* 6*d.* net.

THE COLD STORAGE OF APPLES

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Low-Temperature Research Station, Cambridge.

THE application of mechanical refrigeration to the preservation of English fruit and vegetables is a departure of quite recent date. Twelve years ago, when the Food Investigation Board started its investigations, the only published data on the cold-storage of English fruits and vegetables were those embodied in a report by W. P. Wright[10]* on storage trials carried out at Dartford, under the auspices of the Kent County Council. At that time, therefore, the Board had an unexplored field to work in. Progress has since been slow, owing partly to the seasonal nature of the material and to the multiplicity of factors that influence its storage-life, and partly to the difficulties attaching to the determination of the magnitude of the sampling error. So far, most of the data obtained have only a qualitative value, but in view of the special equipment provided at the new Research Laboratory at Ditton, near Maidstone, and its close proximity to the East Malling Horticultural Research Station, where fruit off trees of known history will be available, it should be possible in the near future to put the results on a quantitative basis.

Senescence in the Apple Fruit.—Attention has been mainly concentrated on the problem of senescence in the apple fruit, in particular the variety Bramley's Seedling.

It should be borne in mind that when gathered from the tree the fruit is a living and breathing organism, containing starch, sugars, malic acid, etc., these being utilized directly or indirectly in the process of respiration. One of the most obvious indications of this process is the evolution of carbon dioxide from the fruit.

A detailed summary of the main chemical, physiological and physical changes which accompany senescence in the apple fruit is given in the Annual Reports of the Food Investigation Board for the years 1920–30, inclusive. In brief, it can be said that no simple relation has yet been found between keeping quality and the concentration of any of the constituents of the apple that have been estimated. The generalization that has been found to hold most widely is that good keeping quality goes with a low content of nitrogen.

A gradual change from green to bright yellow occurs in the ground colour of the skin, and a progressive softening of the

* References will be found on page 593.

flesh, due to the formation of soluble pectins from the pectose of the middle lamella of the flesh cells.

At the normal time of gathering, the respiratory activity (*i.e.* rate of evolution of carbon dioxide) of the fruit,* measured at a constant temperature, first rises to a maximum and then steadily decreases. The curves in Fig. 1 show the course of change in respiratory activity that accompanies senescence at three constant temperatures, namely, 2.5° C., 10° C. and 22·5° C., respectively. At each temperature, the peak value of respiratory activity is approximately 1·5 times the initial value. The time taken to reach the peak value decreases strikingly with rise of temperature. An interesting point to be noted here is that the so-called sweating of the fruit and the production of the characteristic flavour and of certain odourless volatile substances coincide with the rise in respiratory activity. These

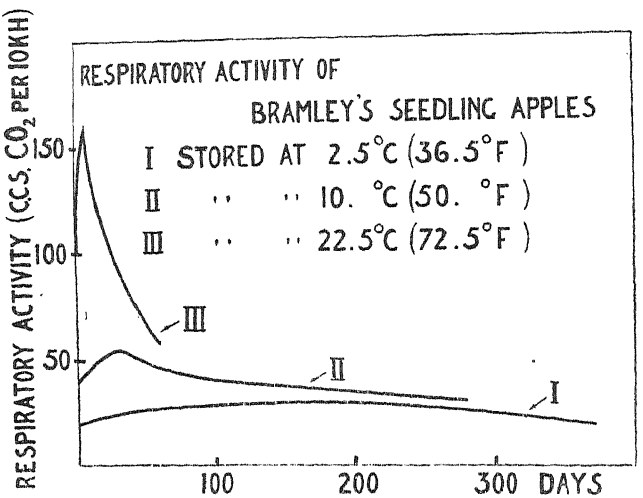


FIG. 1.

changes occur even if the fruit is left on the tree. It will be shown later that an important relation seems to exist between the climacteric rise and the date of gathering, with reference to the quality of the fruit produced and its subsequent history in cold-storage.

Storage Technique.—The following technique has been tried out and adopted.[4] From a limited number of trees, chosen when possible with a known history, samples, each containing 100 apples, are selected in such a way that each sample contains the same number of fruits from each tree. Apples of average size are chosen, the largest and smallest

*The term "climacteric" has been used to denote this stage in the life of the apple fruit.

specimens being rejected. The samples are stored in chambers in which a constant temperature and almost constant humidity are maintained. Periodically samples are withdrawn from storage, and each fruit is cut in halves and thoroughly examined, not only for wastage due to fungal attack and functional disease, but also for quality, *i.e.*, flavour, colour, texture, etc. From the data thus obtained, curves depicting progress of wastage under the given conditions of the experiment are constructed. It was found that when the wastage figures were plotted graphically they followed curves of a characteristic form (Fig. 2). The point at which 10 per cent. wastage occurs has been arbitrarily adopted to denote the commercial life of the fruit; the mean storage life is the time taken to reach the 50 per cent. wastage point. The latter is used when experimental samples of apples are compared. The fact that these curves were not always regular in form, as would be expected

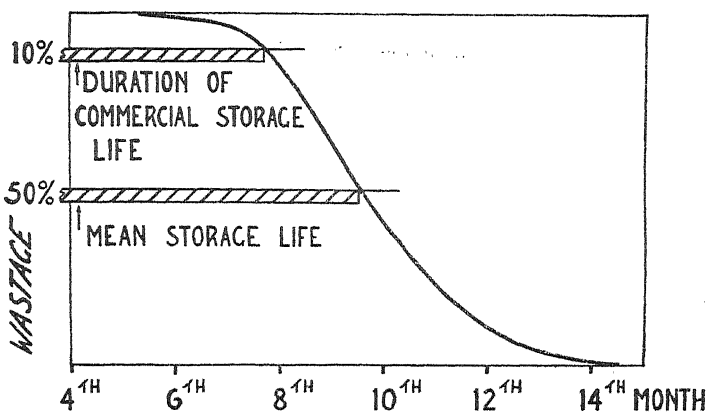


FIG. 2.

if the variation in the keeping qualities of individual apples were uniform about a mean, suggested the fruits from different trees exhibited marked differences in storage qualities.

Individual Variation.—An experiment was therefore designed to ascertain the variation existing between apples off different trees.[4]

Ten adjacent Bramley's Seedling apple trees were selected in a plantation on a very uniform soil. These trees were of the same age and, commercially speaking, identical, but they showed noticeable differences in size and in type of growth. From each of these trees twelve representative fruits were taken, extremes of size being avoided. The apples were stored and kept under

observation at a constant temperature of 54° F. It was found that the individuality of the trees was strikingly represented in their fruit—long life, under the conditions of the experiment, being associated with low respiratory activity (Table I).

TABLE I.

CHARACTERISTICS OF THE APPLES FROM INDIVIDUAL TREES

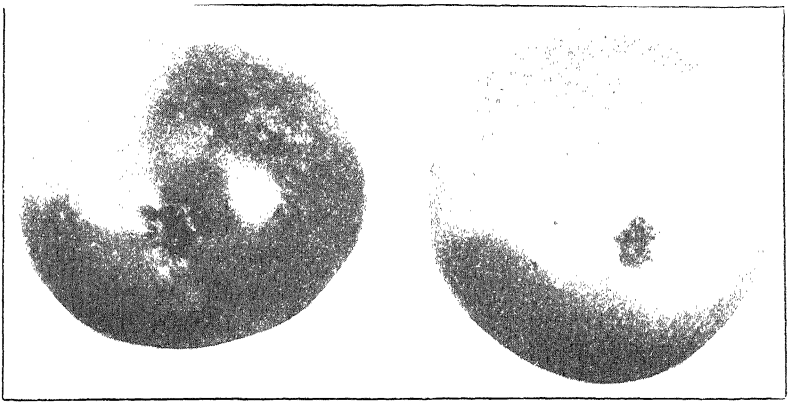
Tree	Size of crop	Average duration of life in days	Average respiratory activity (c.c. CO_2 per 10 K.H. at 12° C)	Average weight (gm.)
M	Very large	216	47	146
J	Small	190	56	165
E	Large	178	54	143
K	Very large	170	54	146
F	Medium	169	57	134
A	Medium	153	57	175
H	Very small	151	60	182
C	Large	148	58	170
D	Large	141	60	150
B	Medium	140	60	173

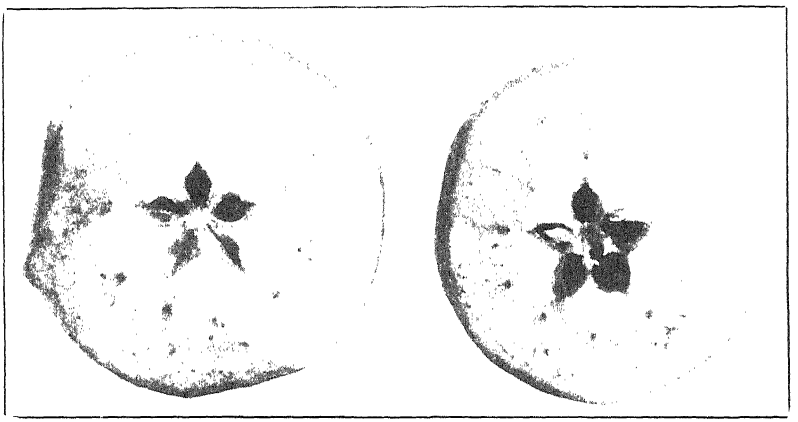
It has recently been shown by Wallace* at Long Ashton that there are marked differences in chemical composition in apples of different size grades off the same tree, whilst Hinton and Swarbrick[3] have further shown that the fruit formed from the terminal flower of the inflorescence differs in many respects from the fruits produced from the lateral flowers.

Cold Storage of Apples.—The use of refrigeration for the preservation of fresh fruit, vegetables and other living plant organs depends essentially upon the principle that chemical reactions, such as those which occur in living systems, are slowed down in rate by lowering the temperature. In typical cases the rate is halved for a fall in temperature of 18° F. In a complex of interdependent reactions, such as is represented by living plant tissues, it is unlikely that the rates of all the reactions will be affected to the same extent by a given change of temperature, so that the ripening process as a whole may not only proceed at a different rate, but may tend to a different end, when the temperature is changed[5]. The aim of successful storage is to retard the rate without changing the nature of the process.† The application of cold beyond a certain point

* Factors Influencing the Storage Qualities of Fruits : *Proc. Imperial Hort. Congress*, 1930.

† In this connexion it is interesting to note that investigations by Zilva and his co-workers have shown that very little loss occurs in the vitamin C content of Bramley's Seedling apples during cold storage at 37° F. for six months.[1]





FIGS. 4 and 5.—Allington Pippin.

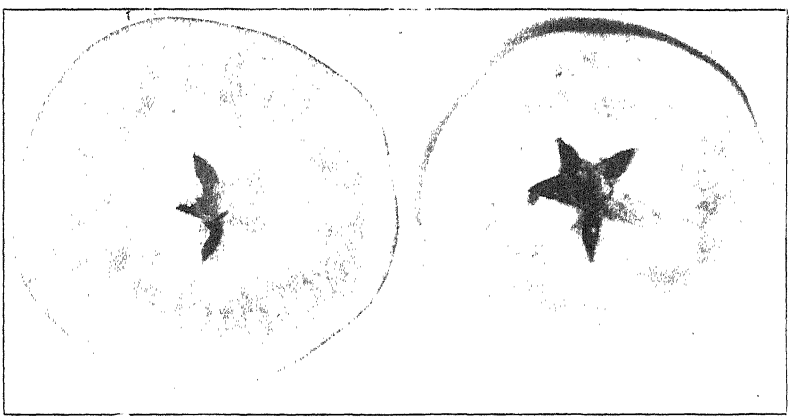


FIG. 6.—Lord Derby.

APPLES SHOWING LOW-TEMPERATURE BREAKDOWN.

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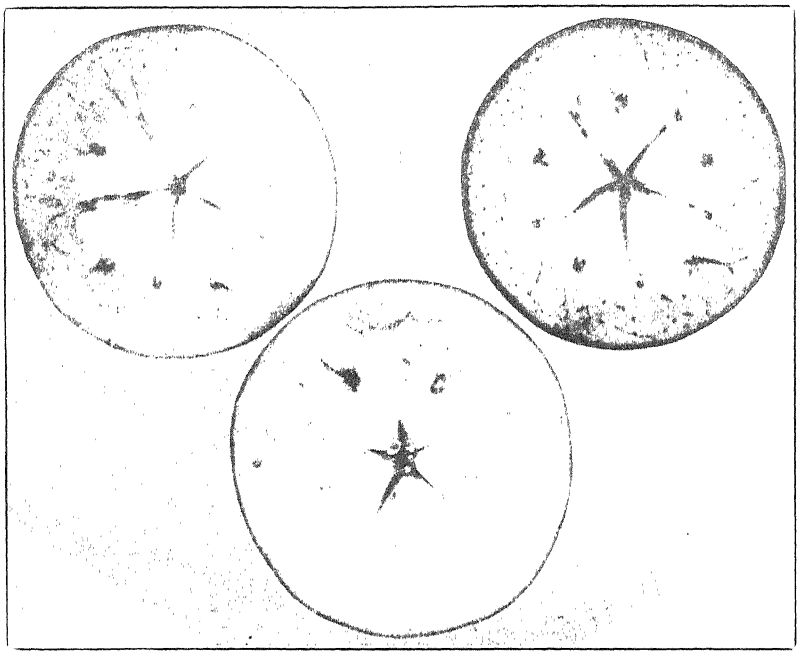


FIG. 7.—Cox's Orange Pippin.

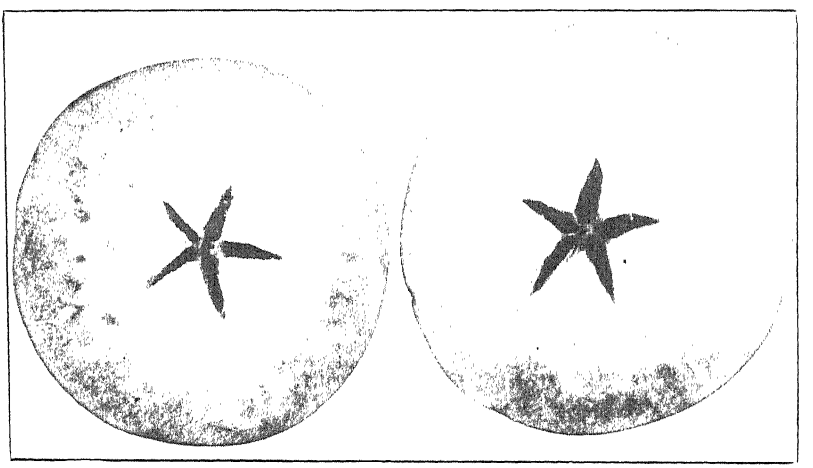


FIG. 8.—Bramley's Seedling.

APPLES SHOWING LOW-TEMPERATURE BREAKDOWN.

leads to ice-formation in the tissues; this, in the case of most fruits, causes irreparable injury.[6]

It has been established that, for every variety of apple tested, there exists a critical lower limit of temperature—as a rule slightly above the actual freezing point of the tissues—below which the fruit cannot be stored for any considerable period without depreciating in condition and flavour and eventually becoming unfit for human consumption. The extreme point of this abnormal condition, in which the flesh shows a characteristic brown discoloration, has been called low-temperature internal breakdown.[4] Typical examples of apples showing low-temperature breakdown appear in the accompanying plate figures.

Owing to the importance of the apple as a food product, a very intensive study has been made of the effects of temperature

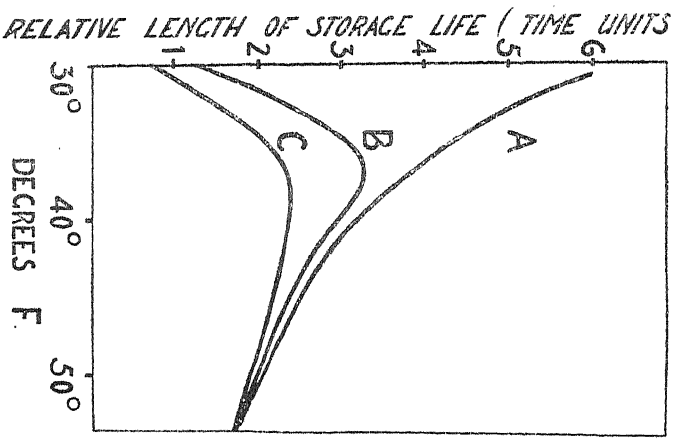


FIG. 3.

upon the storage life of the fruit. It will be convenient to consider in detail the factors that influence the storage life of this fruit at low temperatures, since in a general way they apply to other fruits.

A definite quantitative relationship between length of storage life and temperature of storage has been established for a number of English varieties of apples.[4] The relationship, when senescence (indicated by onset of fungal rotting) ends the life of the fruit, is shown diagrammatically by Curve A in Fig. 3, from which it will be seen that a small difference in temperature may greatly alter the length of storage life.

Curves B and C of the same Figure depict the relation between temperature and storage life of two varieties of apples

characterized by different degrees of susceptibility to low-temperature breakdown. These varieties are the King Pippin (very susceptible—Curve C in the diagram) and the Bramley's Seedling (moderately susceptible—Curve B). Curve A represents the relation for a very resistant variety, namely, the Newton Wonder. It is evident, therefore, that the optimum temperature for cold-storage is that which is low enough to obtain maximum retardation of senescence (ripening), but high enough to avoid wastage from low-temperature breakdown. For example, the storage life of the King Pippin is increased by lowering the temperature to 38° F., but below that the storage life becomes shorter and shorter with successive lowering of temperature, whereas in the case of the Newton Wonder storage life may progressively increase with fall of temperature almost to freezing point.

It is now generally recognized that there is an optimum temperature not only for each kind of fruit, but also for each variety within the kind, depending on the degree of susceptibility to low-temperature breakdown.

Effect of Pre-storage Conditions.—Experimental storage trials have shown that the storage life of the apple at any given storage temperature may be markedly influenced by nutritional factors, such as climate and soil, and by a number of other controllable pre-storage or orchard conditions.[4]

(*a*) *Maturity at Gathering.*—Experimental evidence has borne out the correctness of the wide-spread belief among fruit-growers that there is an optimum time for gathering apples. Fruit picked when immature tends to shrivel and rarely attains perfection of colour, texture and flavour. On the other hand, apples gathered late generally show rapid wastage in storage.

Experiments with Bramley's Seedling apples led to the suggestion that an important relation exists between the proximity of the date of picking to the stage of development of the fruit known as the climacteric and the onset of internal breakdown during storage at low temperatures (Table II).

Confirmatory evidence has since been provided by the experimental work of Plagge[9] and of Harding[2] at the Iowa State College. These investigators showed conclusively that in the Grimes Golden apple *breakdown developed in cold-storage when the fruit was transferred from orchard temperature (50° F.) to cold-storage during the period of high respiratory activity.* The highest percentage of breakdown (82 per cent.)

TABLE II.

RELATION OF DATE OF GATHERING OF BRAMLEY'S SEEDLING APPLES TO ONSET OF LOW TEMPERATURE BREAKDOWN AT 34° F.

Date of gathering	Average temperature in orchard on date of gathering ° F.	Average temperature in orchard since previous gathering ° F.	Percentage of apples showing low temperature breakdown on :— Jan. 31, 1925	Mar. 24, 1925
Sept. 25, 1924	50	54*	0	5
Oct. 6, 1924	50	53	32	50
Oct. 16, 1924	52	54	8	28
Oct. 23, 1924	43	48	2	16

* This is the average temperature for the preceding week.

occurred when the apples were transferred to cold-storage temperatures near the peak of the rise in activity, whereas scarcely any breakdown occurred when the transfer was made either before or after the rise. It is unfortunate that there is at present no simple way of measuring the respiratory activity of the fruit ; the grower is therefore compelled to rely on his own judgment of the correct picking time.

(*b*) *Soil.*—Soil differences have a marked effect on the length of storage life as was shown in an experiment with Bramley's Seedling apples from a small area near Wisbech, where uniform climatic conditions existed, but where there was a wide range of soil texture.* The apples off heavy silt kept twice as long at 34° F. as those off a very light silt.

(*c*) *Climate.*—Comparable cold-storage trials were carried out during eight seasons with Bramley's Seedling apples from the same plantation.[4] Apart from marked differences in date of picking, which presumably depends on the climatic conditions, the latter constitute the only factor that is known to have changed from year to year. Data for the average temperature of the air, for total rainful and for hours of bright sunshine were recorded. It should be borne in mind that these measurements of the conditions are incomplete, although most of the unmeasured factors are determined, as regard their nature and amount, by temperature, rainfall and sunlight. Hence the comparisons between seasons are necessarily qualitative in character. It was concluded that there was little or no correlation with the weather conditions obtaining throughout the

*See the Ministry's Res. Monograph No. 6: *A Survey of the Soils and Fruit of the Wisbech Area.* H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 3*s.* 6*d.*, post free 3*s.* 8*d.*

season. On the other hand the results shown in Table 3 indicate that good keeping quality at 34° F. is associated with warm, dry weather during the few weeks preceding the date of gathering.

TABLE III.

STORAGE-LIFE AND CLIMATIC CONDITIONS PRECEDING GATHERING.

Season	Date of gathering	Mean storage-life at 34° F. (*i.e.*, to 50 per cent. wastage) * (Days)	Weather conditions during the four weeks preceding gathering		
			Average air temperature (° F.)	Total rainfall (In.)	Bright sunshine (Hours per day)
1920–21	24.9.20	280	55·8	1·5	3·7
1921–22	27.9.21	310	58·6	0·7	6·0
1922–23	9.11.22	150	48·8	1·1	4·4
1923–24	3.10.23	200	54·9	2·4	5·6
1924–25	23.10.24	140	51·2	3·9	3·5
1925–26	6.10.25	150	53·2	2·6	3·7
1926–27	Crop too small for experimental work				
1927–28	27.10.27	150	51·2	2·0	3·6
1928–29	No experiment.				
1929–30	13.10.29	220	56·0	0·9	5·2

* The wastage at this temperature was due almost entirely to low-temperature breakdown.

(*d*) *Age of Tree.*—With regard to the age of the tree, it appears that apples from young trees (*i.e.*, under ten years old) are poor keepers in cold-storage even when fruit of the same size grade is used for the comparison.

Gas Storage of Apples.—The most obvious storage factor, other than temperature, is the composition of the storage atmosphere. It has been shown, at first experimentally, but later by commercial practice, that by control of the change in composition of the storage atmosphere brought about by the respiration of the fruit, namely, a reduction in the percentage of oxygen and a corresponding increase in the percentage of carbon dioxide, a definitely retarding effect upon the rate of respiration and the ripening of the stored fruit can be obtained.[7] Temperature plays an important rôle in the operation of this gas-storage method, and optimum results have been obtained at temperatures just above the limit at which susceptibility to low-temperature breakdown commences.[8] In order to obtain suitable temperature conditions refrigeration is essential.

Under the relatively stagnant atmospheric conditions which obtain in a gas store apples are liable to scald unless special precautions are taken. Superficial scald of apples can be controlled by the use of tissue-paper wrappers impregnated with odourless mineral oil. The wrappers should contain 18 per cent of oil.

Gas storage is particularly valuable for varieties of apples susceptible to low temperature breakdown, and may give far better results than cold storage alone. Very satisfactory results have been obtained on a commercial scale with Bramley's Seedling apples.

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MILK FOR SCHOOL CHILDREN: THE LEICESTERSHIRE SCHEME

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Agricultural Department, Leicestershire County Council.

THE idea of organizing a scheme for the supply of milk to school children in Leicestershire was first conceived after reading in one of the Ministry's publications* an account of similar schemes in operation in large towns. It was realized that a scheme on a county basis could not be organized so easily as in the case of a town where problems of distribution were more easily solved, and where supplies of milk could be obtained from well organized distributors. Leicestershire, however, was favourably situated in one most important circumstance. The Agricultural Department of the County Education Committee, in pursuance of the policy of the Ministry of Agriculture, had, for a considerable time, paid keen attention to the instruction of farmers in up-to-date methods of clean milk production, and had, by means of Clean Milk Competitions, Milking Competitions, and by personal visits of the Agricultural Organizer and the County Dairy Instructress, encouraged the adoption of steam sterilization of utensils, the grooming and washing of cows, the use of covered pails, and other improvements in method and equipment known to be essential to the production of clean milk. The result of these activities was a rapid increase in the number of licensed graded milk producers in the county, so that when the question of supplies of milk for school children was first considered, little difficulty was experienced in obtaining good clean milk as produced on the farm.

Also it was realized that the good will of the teaching staffs of the schools was indispensable if the success of the scheme was to be assured, and the first step taken was to approach the headmaster of the Kirby Muxloe Council School, a school about five miles from Leicester. The headmaster readily consented to give his active support to the scheme, the proposal was brought before a meeting of the school managers, the scheme was approved, and authority was given for the supply to be commenced if a suitable purveyor could be found. Fortunately, there was in the village of Kirby Muxloe a Grade "A" milk producer, who readily agreed to supply the milk in bottles, each containing one-third of a pint

* *The Fluid Milk Market in England and Wales.* Economic Series No. 16. Price 6*d.* net, post free 9*d.* Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2.

of milk, for 1*d.* per bottle, and to return a small discount on the money received for the milk, for the benefit of the school sports fund. Through the valuable help of the National Milk Publicity Council supplies of leaflets were obtained and these were distributed to the children. The response of the parents was encouraging, and 112 children commenced to receive supplies of milk on October 30, 1929. This number represented 67·5 per cent. of the number of children on the roll. It will be realized that the conditions of employment in certain areas are apt to affect the spending capacity of the parents and to bear upon the demand for milk for the children, but experience has shown that from 30 per cent. to 60 per cent. of the children on the school registers take the milk.

Development of the Scheme.—The success of the scheme at Kirby Muxloe quickly became known to the managers and teachers in neighbouring villages, and requests were received for the organization of supplies of milk to children attending the Thornton, Ratby and Desford Council Schools. It will be observed that the schools in which the scheme was first commenced were all provided schools; this is explained by the fact that the writer of this article, who has been responsible for the initiation and development of the scheme, is correspondent to the managers of about 25 provided schools in the industrial area of Leicestershire, which has a high school population. It was, therefore, possible for the scheme to be explained to managers and teachers at meetings which the correspondent attended, and to deal with any difficulties that might arise.

It was soon apparent that the rapid growth of the scheme required the adoption of definite regulations, and a sub-committee consisting of members of the Agricultural Education (Joint) Committee and the School Medical Inspection Committee drew up the following scheme, which was eventually approved by the County Education Committee in July, 1930 :—

(*a*) Liquid milk only shall be supplied.
(*b*) The milk to be supplied shall be clean, fresh, and where possible of Grade "A" Standard.
(*c*) Arrangements for the supply of milk to schools shall be made by the Agricultural Department in consultation with the Medical Department.
(*d*) The milk to be supplied in bottles, each containing one-third of a pint and provided with a disc and straw. The price charged shall not exceed one penny per bottle.
(*e*) The milk shall be submitted to a regular bacteriological test by the Medical Department, and the Agricultural Department shall be notified of any case in which the milk is not up to standard.

(*f*) The Medical Department shall undertake the examination of monthly samples and should any supply prove unsatisfactory the Medical Department shall communicate with the Agricultural Department. If after due warning no improvement is obtained, the School Medical Officer shall recommend that such supply be discontinued and a fresh supply procured.

(*g*) The Agricultural Department shall be responsible for the inspection of the farm buildings and dairy equipment of the supplier, except Grade "A" farms which are already inspected regularly by the Medical Department.

(*h*) The head teachers shall be requested not to make arrangements for the supply of milk to school children without prior consultation with the Agricultural and Medical Departments.

Method of Distribution.—The milk is supplied in bottles each containing one-third of a pint of milk with a disc and straw. The bottles and straws are usually obtained from the National Milk Publicity Council, suppliers having found that the charges made by the Council are most reasonable.

Through the disc in the top of the bottle a straw is inserted by means of which the milk is drunk. The bottles are handed to the children just before the morning interval. In summer the milk is often consumed in the playground, but generally the child remains in its desk, and, having consumed the milk, puts the empty bottle in a crate when leaving the room. The supplier decides upon the type of crate to be used, in some instances metal crates being adopted, each holding 32 bottles, and in others, wooden crates. Metal crates would appear to be preferable, being light, easily cleaned, and capable of close packing in the delivery van.

The child brings the money for the milk in advance, usually on a Monday (it has been asserted that this requirement has a good effect upon the attendance of children), and the head teacher pays the supplier at mutually convenient intervals, after deducting an agreed percentage which is used for school purposes, outings, sports, parties, etc.

The number of broken bottles has been surprisingly small; indeed, the useful life of a school-milk bottle far exceeds that of bottles which have to suffer the vicissitudes of the treatment experienced in the average home. The Education Committee accept no responsibility for broken bottles or for fluctuations in the demand.

Selection of Suppliers.—The three most important factors to be considered in selecting a suitable supplier are :—

(*a*) The type of milk produced or distributed.

(*b*) Accessibility to the school.

(*c*) Disposal of milk at week-ends and holidays.

As will be seen from the scheme adopted by the Leicestershire Education Committee, the type of milk supplied is Grade "A," or, where licensed milk of this grade is not obtainable, then milk of the same standard. Of the 155 schools in Leicestershire that were supplied with milk in the week ended July 25, 1931, 82 received licensed Grade "A" milk and 73 milk of Grade "A" standard. Of the 83,461 bottles supplied in the same week, 48,574 contained licensed Grade "A" milk and the remainder milk of Grade "A" standard.

Where the supplier is a licensed Grade "A" producer, the preliminary inspection of premises and equipment is dispensed with, but in all other instances the purveyor is required to submit samples of milk for bacteriological test in the laboratory of the School Medical Officer, and to carry out such improvements in buildings, equipment and method as may be required by the Agricultural Organizer. It is, therefore, obvious that this scheme is bound to be beneficial in stimulating an improvement in the production of clean milk on the farm, and it has already been instrumental in increasing the number of graded-milk producers in the county, thus providing good clean milk for consumption in the villages and towns in the area. In allocating schools to a purveyor, special attention is given to the working out of a convenient itinerary in order that transport costs may fall as lightly as possible upon him. As many schools as possible are allotted to his particular area.

The purveyor's facilities for the disposal of his milk during regular and occasional school holidays, and on Fridays and Saturdays, are an important matter. It is not easy to find such facilities in rural districts, but where the purveyor is the producer of the milk he can often dispose of his surplus to a local cheese factory, or, if he is already a general distributor, he usually finds that the increased consumption of milk in the homes during the week-ends helps him in meeting this difficulty. The writer is of opinion that the ideal type of purveyor is the producer-distributor; when he is so, it is possible to keep a more direct control over the quality of the milk and to remedy rapidly the cause of high bacterial counts reported by the School Medical Officer after the bacteriological tests taken in accordance with the Committee's scheme.

Support from Teachers.—This article would be incomplete without a generous tribute to the whole-hearted support of the teachers. In almost every instance the scheme has been

received with enthusiasm and every effort has been made to ensure its success.

Teachers state that there are well-marked indications of the beneficial effect upon the health of the children through this daily milk ration. Instances have been reported in which parents continued to order bottles of milk for their children during the holidays, and sometimes children absent from school on account of sickness have had the bottle of milk taken to their home by a child living nearby.

General Observations.—The Leicestershire scheme commenced on October 30, 1929, and in the week ended September 6, 1930, 544 gal. of milk were consumed in 46 schools. The number of schools taking part in the scheme in the week ended July 25, 1931, was 155, the consumption of milk in that week being 1,738 gal. In the period September 6, 1930, to July 25, 1931, 1,522,651 bottles of milk (or 63,444 gal.) were supplied.

Thirty-three suppliers now take part in the scheme, 27 of them supplying milk produced on their own farms, while the other 6 are distributors. The daily supply varies from 814 bottles in 11 schools by one supplier to 22 bottles in one school by another supplier. Suppliers receive the same price for the milk all the year round—2*s*. per gallon. The discount given to the school is generally 5 per cent.

Following the successful organization of the Leicestershire scheme, the Education Committees of Leicester and Loughborough have adopted somewhat similar schemes.

There is another possibility that should not be overlooked. In one instance, in which the supply of milk to two schools was undertaken by the Stanton Ironworks Co. from their own farm, the firm provides facilities for the supply of milk in bottles to the workers in their own establishment, and large numbers of bottles are in fact supplied every working week. If good, clean milk is acceptable to men engaged in heavy manual work, it is equally desirable for the many thousands of female workers in our factories, and there is doubtless a wide field for the extension of the scheme in this direction.

The Leicestershire Scheme has been successful mainly because of the co-operation of school managers and teachers, the valuable support of the National Milk Publicity Council, and the possibility of its organization without cost to the ratepayer. The scheme has the unqualified support of the farmers of the county, some of whom have communicated expressions of their appreciation to the County Education Committee.

WOOD PIGEONS

THE wood pigeon is one of the most troublesome pests with which farmers have to contend, and in areas where they are abundant persistent shooting is necessary to prevent serious losses.

The following notes are designed to supplement the information given in the Ministry's leaflet on the subject (No. 307) and to assist farmers and others interested in the destruction of the birds by giving a more detailed account of their seasonal habits and of the methods adopted when shooting them. The notes on feeding habits have been kindly supplied by Mr. Max Baker, and the notes on shooting by Mr. F. Howard Lancum, F.L.S.

Feeding Habits.—The following notes on the feeding habits of wood pigeons month by month afford a clue to their destruction.

January and February.—These are the scarce hungry months for the pigeon tribe. Acorns and other tree fruit have been completely cleared, though sundry berries have become attractive. Pigeons accordingly visit the green crops where they concentrate on the tender tops, thus checking the later growth on which so much depends. In open weather they favour clover and other low-growing crops, turning to the taller and coarser vegetables, such as turnips and greens, when snow covers the ground. They roost in the more sheltered parts of woods, to which the gunner may gain access now that coverts are no longer in need of being kept quiet.

March.—This month marks the seed sowing season when the pigeons, so long deprived of their favourite food, plunder, where possible, the entire sowings of peas, beans and cereals. Particular fields suffer more than others, usually owing to the state of the soil as influenced by the weather after sowing.

April.—By now the migrants have gone and the resident birds have scattered to nest. Food has also become more plentiful, the combined effect being that what is taken goes unnoticed, except where the birds pillage newly-sown seeds. Early peas thus need special watching, as the sprouting shows where to dig. Otherwise the birds mainly frequent the luscious meadows and are exceptionably vulnerable in such places.

May.—Pigeons are still to be found in the rich meadows. They also visit fields carrying garden crops. An incidental food never missed when available is the now ripened fruit of the ivy. In hard seasons this last is consumed during the winter months.

June.—A good many wild seeds ripen this month, especially on arable land. As haymaking progresses grass seeds also become ripe and draw the birds. Mowing exposes the clover that at once springs into growth, providing tender tops of which the birds are very fond.

July.—Peas form the main diet of pigeons during a large part of this month, but as the birds mainly favour the ripened seed that has missed earlier picking the damage is not serious, except where the crop is reserved for seed, but in any case the opportunity provided for shooting should be noted. Early ripening corn is mercilessly attacked; the birds also take weed seeds to be found in its vicinity. As the month progresses laid corn offers temptation to which pigeons readily succumb.

August.—The young birds are now in full vigour; also in excellent condition for eating, so that there is a second motive for pursuing the shooting energetically. The main resorts are now the harvest fields and crops of peas ripening for seed. Certain weed seeds also form a great attraction, observation revealing their location and time of coming into season.

September.—The stubbles now carry an unlimited supply of food, and pigeons compete with poultry, game birds and other species in clearing the feast. Shooting should be very active this month as the birds remain in prime condition.

October.—Acorns, beech mast, sweet chestnuts and hazels have now become ripe and form the main diet of pigeons, which are still plentiful and in good condition. During the month migrants arrive to share the provender. They decoy well in open ground on the borders of woods, especially where isolated fruit-bearing trees are found. Elder and certain other fruits and berries are special favourites at this season.

November and December.—During these months the pigeon population, reinforced by migrants, searches out the remaining stores of tree fruit which are buried under leaves and grass. The shooter should operate in the vicinity of woods, choosing open spaces where passing birds can see his decoys. At roosting time he can post himself on the outskirts of woods at some selected point of entry. As winter conditions become more pronounced pigeons turn their attention to green stuff of all sorts, as usual favouring the plants making new growth.

Pigeon Shooting.—The three principal methods of pigeon shooting are (1) organized and synchronized shoots over a large area; (2) waiting in cover for the incoming birds at

roosting time; and (3) shooting from a "hide," with or without a decoy.

(1) The first is an effective method of reducing the numbers of wood pigeons, provided that a fairly large area is covered, that the guns are sufficiently expert and numerous, and that the time for the shoot is generally agreed upon by all concerned. Groups of guns are stationed at suitable points, and the essentials to success are that the birds shall be kept constantly on the move and that as much noise and commotion as possible shall accompany the proceedings.

(2) The second method is useful if the pigeons' roosting places can be marked down without preliminary disturbance of the birds. It calls for quick and accurate shooting, and is better from a sporting point of view than from the strictly utilitarian.

(3) The third method is the one most generally adopted, and if judgment is used as to the "pitch" selected, and care is taken when entering and leaving the hide, it is possible that more can be accomplished in this way than in any other. In the first place, the shots presented are much easier than those usually available under the other methods. A moderate or even a poor shot can, with reasonable care, account for quite large bags on suitable days, for in practically every instance the pigeons can be shot at rest, either on a tree or on the ground.

The hide can be situated in or near any field where pigeons have been observed to be feeding. An ideal place for a hide is a dry ditch under a hedge between two fields. If there are a few isolated trees near at hand, so much the better, for pigeons will almost invariably settle in them for a final survey before coming to earth. The hide itself should be constructed of materials that are natural to the district, and should, of course, be as inconspicuous as possible. It should be roomy and comfortable, and should be roofed in with twigs, grass and other rough herbage gathered close at hand, and a few spy-holes should be pierced at convenient points.

It should be remembered that any *visible* movement of the shooter's person or gun may be fatal to the chances of a shot. Pigeons do not worry overmuch about slight, unexplained noises, provided always that the causes of such noises remain unseen; but a protruding, moving gun barrel or finger tip, if detected, will cause any pigeon to depart in a hurry.

In places where food is plentiful and which are habitually

visited by feeding pigeons, decoys may be dispensed with, but it is, nevertheless, always advisable to use these if possible. One, two, three or more can be put out, but two should be found sufficient; indeed, a single decoy is often all that is usually necessary. There are many admirable artificial decoys on the market, made of wood, rubber, felt and other materials, but nothing is better than a well-stuffed, natural pigeon. Such a bird should be affixed to a rough, flat board, and may be mounted in either an alert or a feeding position. One thing is vitally important—any bird mounted in an attitude of attention must be placed with its head to the wind. The distance from the hide to the decoy should be about 30 yards.

In the writer's experience, there is one direction in which a stuffed bird will always be found superior to an artificial decoy. The latter will probably attract pigeons just as readily, but the natural bird will, in some cases, *keep* the pigeon there when an artificial decoy might fail to do so. The crack shot asks for nothing better than that a pigeon should be attracted to the spot, but inexperienced individuals are always glad of a few seconds in which to prepare for a shot.

The shooter should be careful not to emerge from a hide to pick up a bird while there is a possibility of other pigeons approaching, or if those disturbed by the report are still on wing. It is better even to leave dead birds lying about than to show oneself too often. If, however, the shooter does leave the hide, he should be careful to pick up any stray feathers. If a good spaniel or retriever can be procured for the purpose of bringing in the shot birds, nothing can be better. Pigeons, like most other birds, pay little attention to a dog.

The wood pigeon's sense of smell, like that of most birds, seems to be very rudimentary, but the writer has found it better not to smoke when waiting in a hide. Tobacco smoke arising from a hedge is very noticeable, and pigeons, even if not actually scared by this, will watch the spot more closely and may detect some movement of the shooter within.

Of all the places where pigeons feed, the most attractive to the birds is a pea field when the peas are ripe, and if a hide can be constructed in or near such a field, and there is water in the vicinity, no better place could be desired. Pigeons are very fond of peas, and when eating them in quantity get very thirsty, making frequent visits to the nearest water to drink. If the shooter can enlist a friend, and can station him in a hide near the drinking place while he himself lies up by the pea field, the two should have no difficulty in bagging

practically all the pigeons that come along. The report of a gun matters little to a pigeon. It is true that, for a time, all the birds in the vicinity will be alarmed when a gun is fired, but they seem to have little sense of direction, and, provided that no enemy is visible, they will soon return to the feeding places.

A double twelve-bore gun is the best for the purpose, and any good standard load will do. As to shot sizes, nothing smaller than sixes should be used. Fives are better, and fours better still. With the last-mentioned size, the slight loss of pattern is more than compensated for by the increased striking force and penetrative power. Pigeons sometimes take a good deal of killing.

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RESEARCH INTO SWINE DISEASES

THE Pig Industry Council has given much consideration to the question of the measures that might be taken to reduce losses from pig diseases and has recently submitted to the Minister of Agriculture and Fisheries the following report on this subject, which is published in this JOURNAL for the information of all interested in the pig industry.

REPORT TO THE MINISTER OF AGRICULTURE AND FISHERIES BY THE PIG INDUSTRY COUNCIL.

The Pig Industry Council is satisfied that the progress and development of the pig industry in this country is retarded to an appreciable extent by reason of the very considerable losses that are either directly or indirectly associated with disease. Serious dislocation of markets is often caused by a glut of immature pigs sent in and slaughtered because of local outbreaks of various pig diseases. In this connexion it should be noted that, apart from the losses from those diseases for which no complete statistical records are available, the deaths due directly to swine fever amounted in 1928 to 17,566 and in 1929 to 50,181.

The Council is of opinion that measures should be taken to reduce such losses to the lowest possible limit, and would emphasize that this action would not only prove of financial benefit to the individual owner but would also tend to establish that confidence in this branch of animal husbandry which is so essential for its progressive development.

The Council has given most careful consideration to the means whereby this objective may be attained, and is convinced that the immediate needs of the industry in this connexion require :—

(i) Continuous and intensive research into the diseases of the pig;
(ii) The establishment of a scheme which will ensure that the veterinary profession and the industry may promptly acquire information of the progress of research so that the most modern methods of prevention, diagnosis and treatment may be adopted;
(iii) The state control of sera and vaccines used for the prevention or treatment of pig diseases in order to ensure that such products are potent.

Research.—Apart from the upkeep of the Veterinary Laboratory of the Ministry of Agriculture and Fisheries at Weybridge, which is primarily concerned with the diagnosis of various diseases scheduled under the Diseases of Animals Acts, the principal grants allotted for research into animal diseases for the year 1929–30 were approximately as follows :—

Institution	*Subject*	*Grant* £
Cambridge University	Animal Pathology	10,700
Cambridge University	Protection of Calves against Tuberculosis by vaccine	375
Royal Veterinary College	Animal Pathology	5,150
Liverpool University	Pregnancy Disease of Ewes	200
Ministry of Agriculture and Fisheries (Foot-and-Mouth Disease Research Committee)	Foot-and-Mouth Disease	15,000

A grant of £5,200 is made to the London School of Tropical Medicine for parasitology research, but it has been ascertained that no specialized research regarding the parasites of the pig is being carried out.

Apart from the Veterinary Laboratory at Weybridge and the School of Tropical Medicine, the grant for research into animal diseases is approximately £30,000 a year. Of this sum £15,000 is utilized exclusively for foot-and-mouth disease research, whilst a considerable proportion of the remainder is expended on research into tuberculosis and other diseases. The sum available for research into specific diseases of swine must, therefore, be very small.

According to the evidence which has been obtained, it appears imperative that investigation into the diseases and parasitology of the pig should be commenced without delay.

Diseases which are causing the most serious losses at the present time are swine fever, swine erysipelas and certain diseases of the unweaned pig. It is our opinion that special attention should be given to these with the object of ascertaining improved methods of prevention, diagnosis and treatment.

Location of Research Station.—The Council is of opinion that the proposed research into the various pig diseases should be concentrated at one centre instead of being allotted to various research stations; it is nevertheless hoped that in exceptional

cases grants for specific research will be available for allocation to other Institutes, if adequately equipped and staffed to undertake research into specific diseases of the pig.

It is considered desirable to emphasize the first and major half of this recommendation, partly because much of the proposed work is correlated and partly because such an arrangement will enable staffs, buildings, etc., to be utilized in the most economical manner. The station should be attached to one of the existing centres of research rather than be established as an entirely independent unit. This will enable full and economical use to be made of the existing workers specializing in pathology, helminthology, etc., and thus avoid unnecessary duplication and overlapping of these posts which would result if an independent station were established.

After taking all factors into consideration it is recommended that the proposed research station should be located at the existing establishment at New Haw, Weybridge, Surrey.

Among the reasons which influenced the Council in this decision are the following :—

(*a*) the premises are better equipped for this particular research than those of any other existing Institution ;

(*b*) there are approximately 100 whole-time and 266 local veterinary inspectors (part-time) employed by the Ministry, and these are required to submit morbid material for examination in connexion with swine fever, swine erysipelas, etc., to the Ministry's Laboratory at New Haw. Apart from the great utility of such material in connexion with research, it is considered that this field staff would prove of the greatest value as a means of liaison between the research station, the veterinary practitioner and the pig owner.

Staff.—It is not proposed to make recommendations as to the staff other than to suggest that there should be a technical officer specially detailed for research into pig diseases, who, although acting under the control of the Director of Research, should nevertheless be responsible for the co-ordination of research work on pig diseases, for dealing with correspondence relating thereto and for keeping in touch with the needs of the pig industry with regard to the various disease problems.

The Establishment of a Scheme whereby the Results of Research may be made known to the Veterinary Profession and through it to the Industry.—It is recognized that the usefulness of research will be considerably decreased unless the veterinary practitioner, veterinary advisory officer, county agricultural organizer and the pig owner can be kept informed as to the progress made. It is considered that difficulties in this connexion might be overcome by :—

(i) The circulation of articles in both the professional and lay Press, the former dealing with the subject from the scientific point of view and the latter in popular terms.

(ii) The provision of facilities to the veterinary profession to visit the research station at will, and to witness demonstrations regarding improved methods of diagnosis, treatment, etc.

(iii) The constant communication to the Ministry's whole-time veterinary inspectors and the veterinary advisory officers of information as to any progress made, preferably by means of short courses of instruction, in order that they may be able to act in a consultant capacity if required by a veterinary practitioner.

(iv) The furnishing of all possible assistance by the research station, through consultation or otherwise, to veterinary surgeons who may be in doubt regarding any disease of swine.

It is considered that by these methods an increasing number of veterinary surgeons will be stimulated to take a greater interest in swine diseases.

The State Control of Sera and Vaccines normally available for the Prevention or Treatment of Disease.—The Council has noted the divergence of opinion regarding the utility of the various sera and vaccines which are on the market at the present time. It has been ascertained that a large quantity of the sera and vaccines used in this country are produced abroad, and it appears possible that the varying results obtained may be due, in part, either to the fact that a proportion of the sera and vaccines are not potent against the types of disease present in this country or to deterioration from various causes prior to administration.

It is obvious that any progress made in improved methods of prevention and treatment will be nullified to a large extent unless biological products of adequate potency are available. It is, therefore, advised that the State should adopt measures of control to ensure that only sera and vaccines of approved potency should be offered for sale, and that these should be available at the lowest possible cost.

It is recognized that certain types of vaccines are capable of causing serious losses if employed by inexperienced persons; it is accordingly suggested that these should be available for use only under the direction or control of a qualified veterinary surgeon.

Summary of Recommendations.—The Pig Industry Council recommends to the consideration of the Minister:—

(1) The establishment of a central station where continuous and intensive research regarding the diagnosis, prevention and treatment of pig diseases may be carried out;

(2) The introduction of some system whereby the veterinary profession and the pig industry may be made acquainted from time to time with the progress of research;

(3) The control of sera and vaccines with the object of maintaining their standard of potency for the treatment or prevention of diseases for which they were devised.

March 14, 1931. RADNOR, *Chairman.*

GRASSLAND ADVICE IN THE MID-EIGHTEENTH CENTURY

G. E. FUSSELL,
Ministry of Agriculture and Fisheries.

THE development of rotational grasses, as an integral part of improving agriculture, began in the seventeenth century, but spread with increasing rapidity in the eighteenth, and finally became a stable factor in English farming, almost throughout the country, in the nineteenth century. There had been books written on different grasses before the middle of the eighteenth century. Yarranton had written on clover in the seventeenth century, and several writers had dealt with lucerne, sainfoin, timothy, etc., but Richard North* showed just how far the culture of forage crops had become common and what they were, with the methods of cultivation that were recommended. It must not be understood that the practices he describes were the general routine of the ordinary farmer of the time. They were only followed by a number, few in proportion to the whole farming community, and North's small pamphlet of 39 pages is mainly propaganda, though it may describe the methods of the most advanced farmers of the time.

North, however, like other writers who wish to appeal to farmers, claims that the whole of the book is made from his own observations and inspections. Whether we accept that statement or not is within our liberty. He was, however, a market gardener at Westminster Bridge End, Lambeth, and probably sold grass as well as other seeds. The contents of the book deal with clover, hay seeds, turnips, rape and cabbage for feeding horned cattle and sheep, and an account of natural and made manures, how they are used and the prices at which they are sold about town. As a make weight it throws in directions for trench plowing and an account of the sound growing of Norfolk willow. When Donaldson wrote his *Agricultural Biography* in 1854 the book was not in the British Museum, but it has since been acquired.

As a preliminary to the more detailed contents North issues a warning that "No Kind of Cattle should be suffered

**Account of the different kinds of grasses propagated in England, for the improvement of Corn and Pasture Lands, Lawns and Walks*, 1759.

to pasture upon new sown Grass while it is young and tender ; for they will tread and hurt it very much, and tear it up by the Roots."

His instructions for the cultivation of clover are terse and to the point. " Great broad leav'd clover," he says, may be sown in August or April at the rate of 16 lb. an acre. If sown under barley or oats, it should be sown directly after the corn is harrowed and bush harrowed and rolled with a wooden roller. Some farmers, however, tread it in with sheep. During the February or March after sowing, 60 bushels of lay stall manure or 20 bushels of peat ashes an acre should be applied, or, if this is not possible, 8–10 loads of good short mixen dung. The clover ought to be pastured down close before the manure is applied and the manure should be spread at once. Peat ashes ought always to be applied with a hopper. A crop of clover seed should not be harvested until the crop has been mown for hay or eaten off.

An example of the curiously casual way in which improvements in farming practice are sometimes discovered and developed is contained in a story which North tells about what was known as Marl Grass to some improving farmers in the Western Counties. " Last summer, 1758, being in *Somersetshire*, in the Neighbourhood of *Wells*, where this Trefoil (Perennial Red Clover) first had the appellation of *Marl-Grass*, and where it is rais'd in great Quantities for Pasture, for Hay and for Seed ; being very desirous to acquaint myself with the Nature and Culture of this Grass, I bestow'd three or four Days to inspect it in the Fields where it grew, and to inform myself about the Management. One *Jonathan James*, a Farmer at *Chilcompton*, near *Wells*, in *Somersetshire*, told me his Father some Years ago was the first person in that County, or anywhere thereabouts, that rais'd this *Marl-Grass*, when broad Clover was not so much known as it is now. The Farmer observing a great Deal of this wild Clover growing about his Farm, and thriving exceedingly in such Places as had been mended with deep blue, or what they call black Marl ; where it was convenient he let it stand, and ripen the Seed, which was gather'd and clean'd out from the Husks and sown the Spring following. From this Beginning, Farmer *James* went on with cultivating this Kind of Clover, from Time to Time, increasing his Quantity, and supplying his Neighbours and others, with the Seed ; so that at this Time, the present Farmer James, and many other Farmers and Gentlemen in *Somersetshire*, *Gloucestershire*, and

the contiguous Counties, raise great Quantities of this Grass for Pasture for Hay, and for Seed, which Seed is frequently sold at *Bristol*, and other Market Towns in the West Country, by the name of *Marl-Grass* ; and for two or three Years past has been sold in *London* at a very extraordinary Price, by the Name of *Perennial red-flowering Clover*."

In the event the seed bought in London did not turn out so well as expected, but that might perhaps have been anticipated. The culture of " Marl-Grass " was much the same as that of other clover. It was sown in the Spring with barley or oats at 16–18 lb. an acre, covered with a bush harrow and rolled. The following January, February or March 40-50 good cartloads of marl were applied, the crop being pastured with sheep in May, thereafter being let go for seed, the final product being thrashed and rubbed out of the husks by mills. The farmers who grew it affirmed that, if marled, it lasted 15–20 years, but if not only for two or three. The crop was pastured, mown for hay or left for seed as convenient. Dwarf clover was treated in the same way, as was Nonsuch or Hop clover, while Dutch clover is recommended for lawns, walks, etc. North, however, prefers broad leaved clover to any other as a crop.

Another grass of value, in North's opinion, was " Rey grass," which grows on stiff soils or gravelly clay. In his view it should be sown on corn and made excellent hard hay if cut while the sap was full in it. The grass lasts six or eight years. Sainfoin, sown in spring on shallow, chalky, dry, upland farms with oats or barley at 6 bushels an acre, will last 15–20 years, where the land agrees with it. He did not, however, believe in drilling this crop.

There was at that time a great deal of enthusiasm amongst farming writers for lucerne. North thinks it not so proper for pasture or hay, but good for horses in the house or for early green fodder for cattle : ¼ or ½ acre will produce great quantities of this green fodder early in spring and all the summer long. He had been told that one acre would keep four or five draught horses from the beginning of May till near Michaelmas without any other assistance. It should be sown in drills in deep-ploughed fine tilth at 6 lb. an acre in the beginning of May and should be hoed between the drills during growth. Cutting may be commenced when the plant flowers in August, and the crop will yield four to five cuttings from May to October,

provided that the spaces are dug in winter and hoed in summer every time just after the "grass" is cut.

Spurrey (usually regarded as a most troublesome weed to-day) is recommended for sandy land, but North confines himself to saying that it is thought to be good for cattle, sheep and poultry, also that it was sown in August to feed sheep in winter and spring when pasture was scarce. It was sown at 12 lb. an acre, bush harrowed and rolled. Mutton fed on it, he adds, was said to have a most excellent flavour.

All these things were comparatively new and only practised in isolated districts by a few of the more progressive farmers at the time when North wrote. The generality of farmers collected hayseed on the floor of the hayloft and sieved it to separate it from the coarse stalks. North points out that it was impossible to obtain the best seed in this way, because hay is mowed when in full bloom. He suggested that to get good seed, the farmer should choose some fine upland meadow, wait till the seed is "pretty near ripe," mow, spread to dry, and then thrash. The seed obtained in this way should be sowed at 5-6 bushels an acre, but would be improved by the addition of 5-6 lb. of Dutch clover. The seed should be very clean and fine and should be bush harrowed and rolled twice after sowing.

Not completely satisfied even with this practical innovation North puts forward the idea that seeds mixtures of a selected kind might better be used. His ideas were: 10 lb. broad clover and 1 lb. of rye-grass, the latter being included because it was said to prevent the clover blowing the cattle; 5–6 lb. clover with 3 pecks of black seed (*i.e.* hay seed) and ½ bushel of rye-grass, a mixture good for both hay and pasture; 8 lb. Nonsuch trefoil and 8 lb. broad clover for wholesome pasture, or, if cut when trefoil is in bloom, good hay; with sainfoin 6 lb. Nonsuch trefoil would be of great advantage to the first crop of hay. All these mixtures should, of course, be sown under corn and treated in the same way as clover.

The natural transition for a man of that day was from grasses to roots, because turnips for feeding were gradually spreading through East Anglia and thence over the land. He says there were many sorts, but that two were good for feeding cattle and sheep. These were Round or Pudding Turnips and the Green Round Turnip. The first should be sown from June to the middle of July, the second might be sown from

June to the middle of August. The land should be ploughed three times and 20 loads of good yard or stable manure should be applied before the last ploughing. The usual quantity of seed was 2 quarts and should be harrowed in and rolled with a wooden roller. The crop should be hoed when four or five leaves appear, leaving the plants 7-8 in. apart. A month later they should be hoed again. The early sown should be singled more widely to 16-18 in. apart. North recognized that turnips were a chancy crop, and suggests that if the seed misses and the season is advanced the area should be ploughed in September or October and rye or tares sown, which make good pasture in spring when turnips have failed.

Rape was grown in many parts at that time for fodder and for its oil, both on fenny land and on stiff gravelly soil. In Yorkshire and Lincoln it was and had been for a century the practice to pare and burn the fens for rape. It was sown at 3 quarts an acre and afterwards treated as the turnip crop. If rank and large it was fed off with sheep in February or March.

Cabbages were also gradually becoming a field crop, perhaps more in Yorkshire than elsewhere. North recommended four varieties, the large white, Savoy, turnip and cole, all of which he said were excellent fodder crops. Wiltshire dairymen grew the large white, while in the neighbourhood of London Savoys were cultivated for feeding the cows in winter and spring, but North conveys a warning that cattle must not be kept entirely upon them. Tares or vetches and rye or secale were also crops that would form excellent spring feed.

Thereafter the book passes on to manures. Of the artificial fertilizers of the day marl was coming into prominence and favour. It was applied at the rate of 100 cubic yards to the acre, and North says that 100 cartloads will last 20-30 years, as was the experience of Cheshire and the other marling counties. Fuller's earth was used in some counties instead of marl. The application of a close, fat, melting loam at the rate of 50-200 cartloads will improve light sandy corn lands. Next comes the usual rigmarole of sand on clay, burnt clay ashes on cold stiff lands, at 15 loads on grass, 20 on tillage; peat, chalk, lime, mud from rivers and ponds, sea sand and small shells, sea ooze and seaweed, etc. Rape cakes or oil cakes were also used in some districts for wheat or barley at 20 bushels

an acre, first being crushed or broken with a flail. The cost of this material was 1*s.* per bushel.

The ploughing in of tares, or buckwheat in full bloom is also recommended, and trench ploughing is said to be good because it turns up the pure Virgin Earth that has ever lain unfertilized by Sun and Frosts.

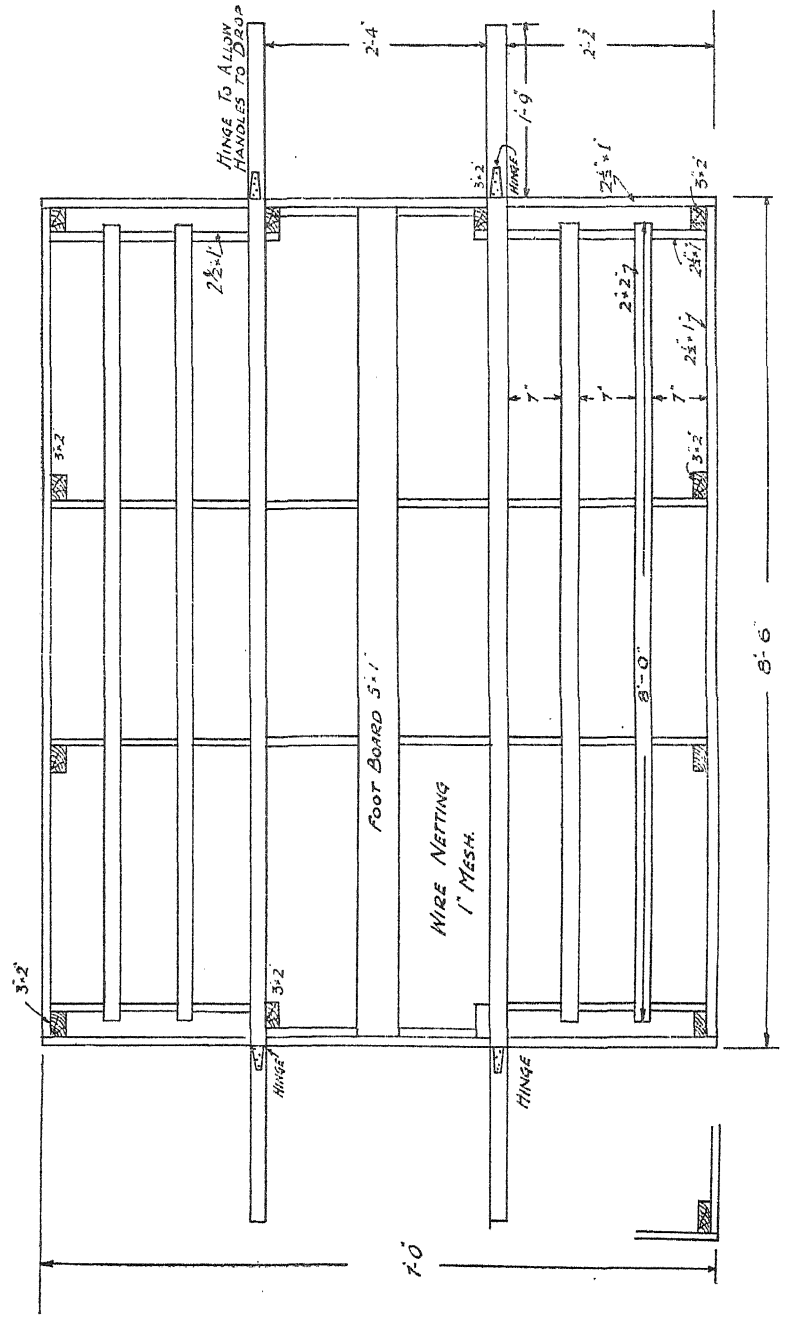
As already observed, the practices which North recommends must not be taken as a reflection of the common measure of contemporary farming. Much is mere theory, but a good proportion is a record of what was being done by those who were prepared to experiment with innovations, while some of the suggestions are, as has been shown, a record of what was different from the common routine of districts then comparatively inaccessible and unknown. The use of such books at the time when they were published was to make available a knowledge of these parts, almost foreign to parts of the country remote from them, and thus make it possible for the new practices to be adopted in suitable circumstances, although the inherent natural conservatism of the farmer did not necessarily lead to this desirable end at once.

* * * * * *

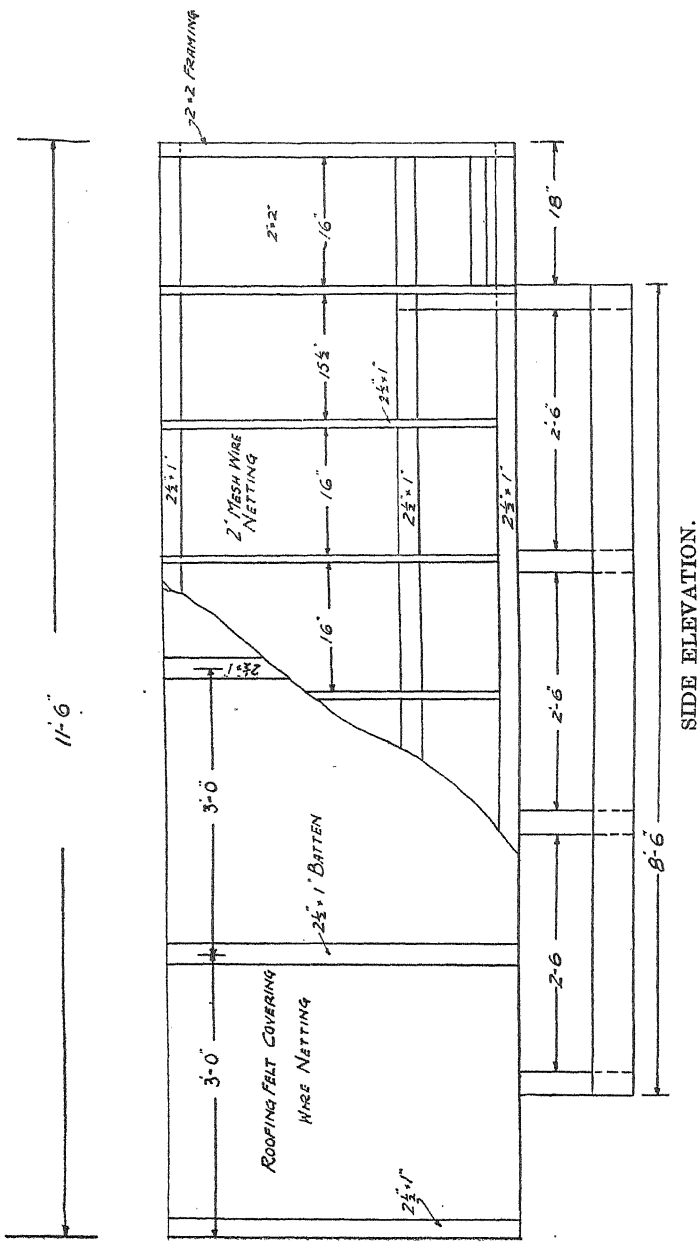
RANGE SHELTERS FOR YOUNG POULTRY

Professor RAYMOND T. PARKHURST, B.Sc. (Agr.), M.Sc.,
Director, National Institute of Poultry Husbandry, Newport, Salop.

FOR healthy development of pullets for laying, and cockerels for breeding, an open-air shelter on a range is ideal. To make such a house, accommodating from 100 to 125 birds, will cost from £6 to £8. Any size can be adopted, but it is not easy to move a house measuring more than 7 ft. by 8 ft. 6 in., the size recommended for this number of birds. As will be seen from the plans and photograph, a shelter of this type is easy to construct and light in weight. The floor is made of 1 in. mesh wire supported by 5 in. by 1 in. main, and 2½ in. by 1 in. intermediate boards. These intermediate boards should be levelled to a ½ in. width at the top in order to lessen the accumulation of droppings. The sides and two ends are of wire. The roof is made by placing felt roofing over 2 in. mesh wire netting and battening it with 2½ in. by 1 in. laths.

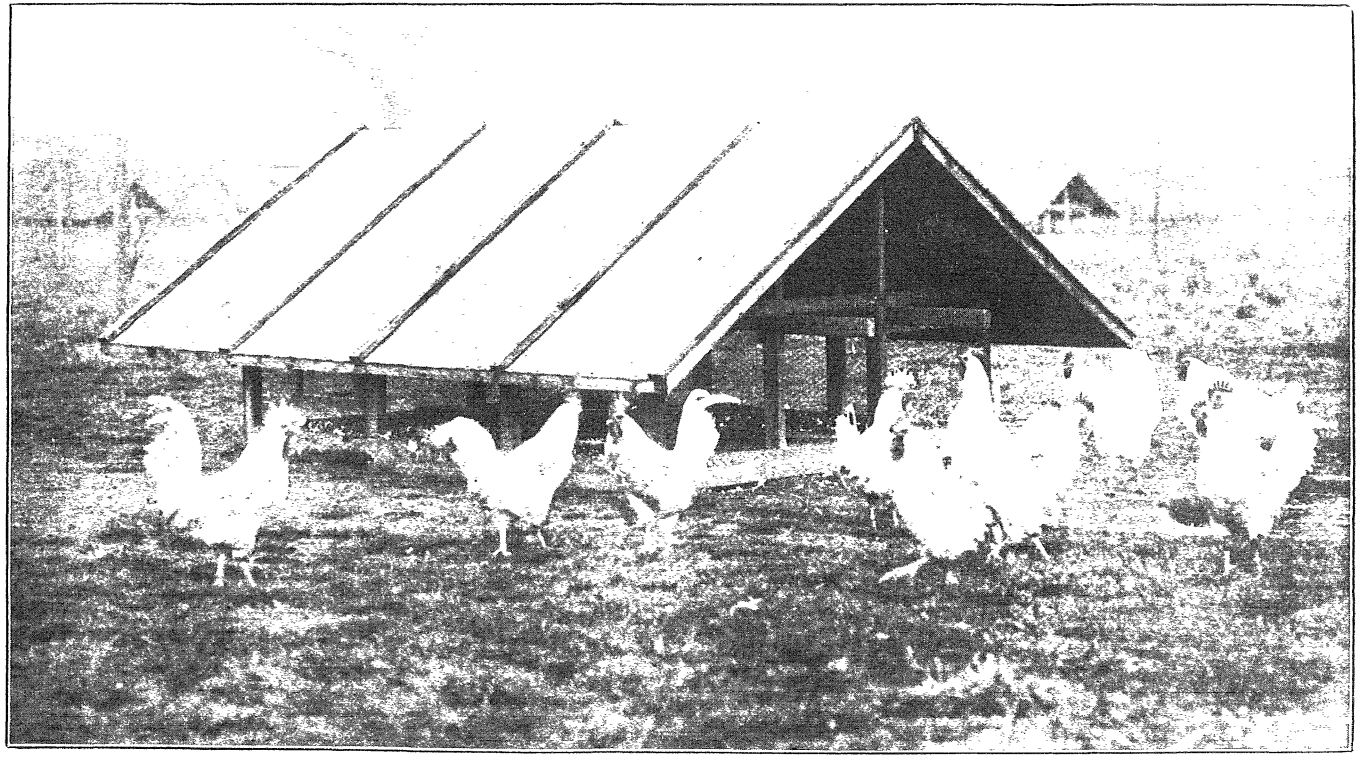

HINGE TO ALLOW HANDLES TO DROP
2'-4"
1'-9"
2'-2"
HINGE
3"x2"
2½"x1"
2"x2"
7"
FOOT BOARD 3"x1"
WIRE NETTING 1" MESH.
3'-0"
3'-6"
7'-0"
HINGE
HINGE

PLAN.

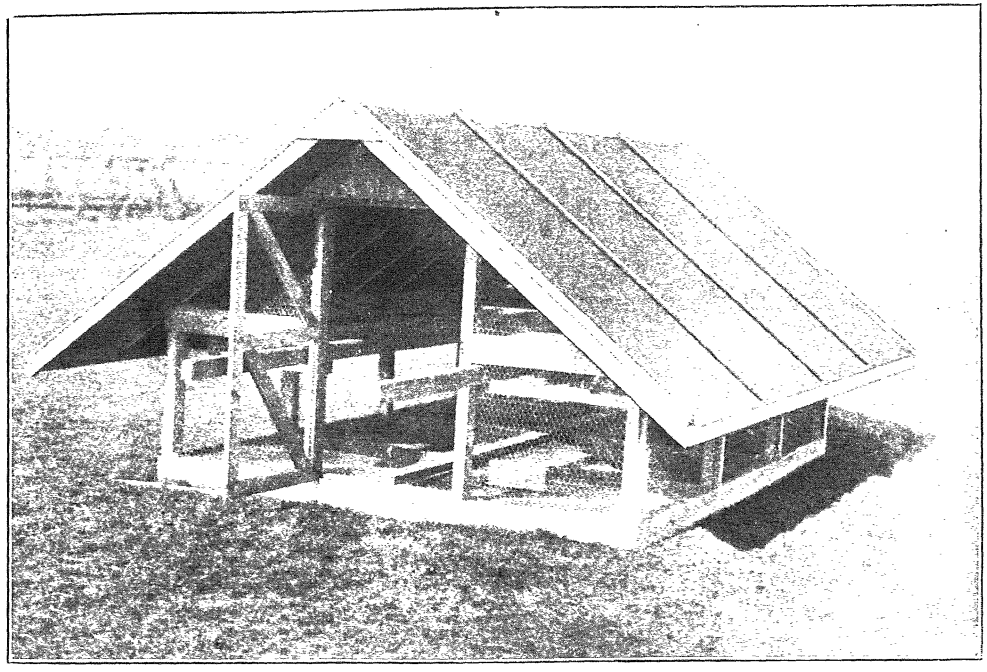


SIDE ELEVATION.

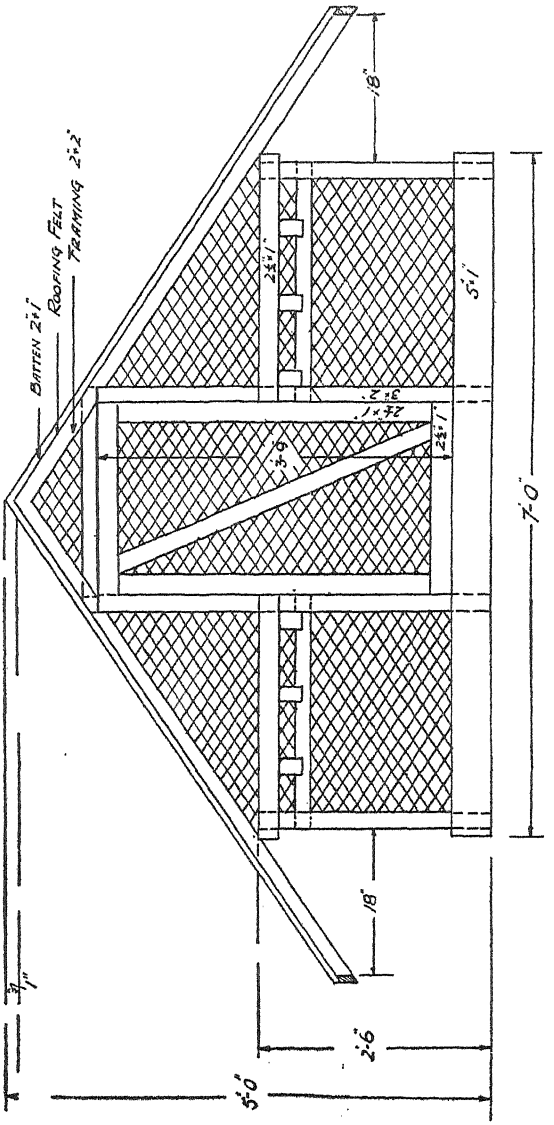
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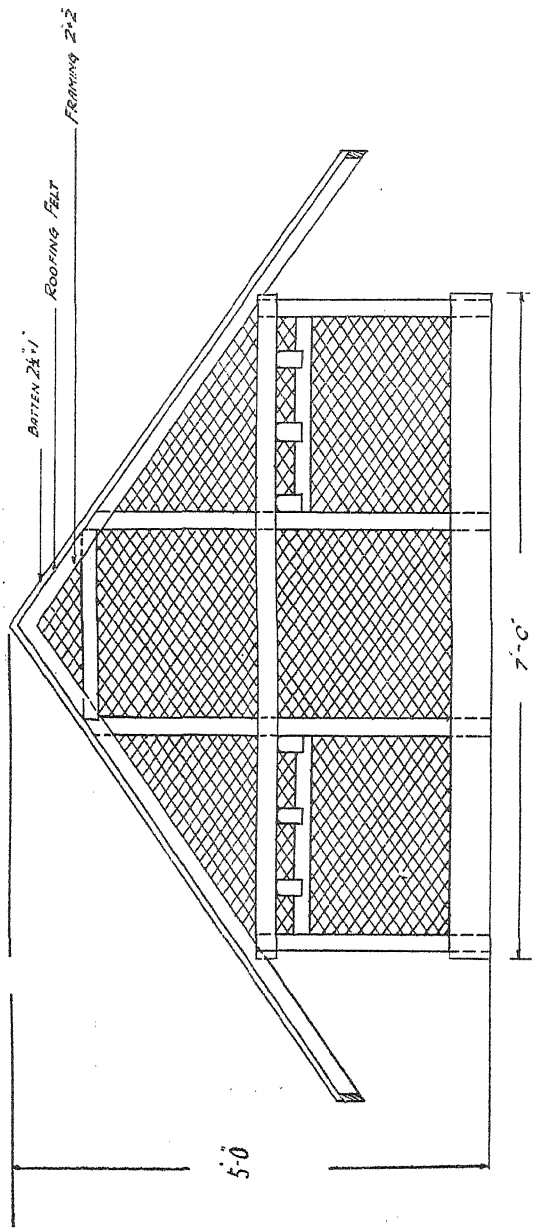
A range shelter in use for breeding cockerels.



A summer range shelter for young poultry.



FRONT ELEVATION.



REAR ELEVATION.

The following are the materials required for the summer range shelter :—

	Number of pieces	*Size in inches*	*Length in feet*
Door ..	2	2½ × 1	2 4/4
	2	2½ × 1	3½
	1	2½ × 1	4
Front ..	1	5 × 1	7
	4	2½ × 1	2½
	2	3 × 2	4½
	1	3 × 2	2¼
Back ..	1	5 × 1	7
	1	2½ × 1	7
	2	2½ × 1	2½
	2	3 × 2	4½
	1	3 × 2	2¼
Two sides ..	2	5 × 1	8½
	2	2½ × 1	8½
	8	3 × 2	2½
Roof.. ..	24	2½ × 1	6¼
	4	2 × 2	6¼
	3	2½ × 1	11½
	8	2 × 2	1½
Floor ..	2	5 × 1	7
	2	5 × 1	8½
Perches ..	4	2 × 2	8
	2	2 × 2	12

Total timber required :—

248½ft. 2½in. × 1in.
62 ft. 5 in. × 1in.
24½ft. 3 in. × 2in.
91 ft. 2 in. × 2in.

Planed both sides, square-edged.

SUNDRIES

1 pair 2 in. hinges.
1 button.
1 strip 1 in. mesh 2½ ft. wide, 25½ ft. long for floor.
1 strip 1 in. mesh 2½ ft. wide, 17 ft. long for two sides.
1 strip 1 in. mesh 2½ ft. wide, 22 ft. long for back and front.

When artificial heat is no longer needed, the chicks can go directly into the summer shelters. Ordinary sacking, or shutters, will provide additional warmth if desired. Because of the wire floor, a considerable quantity of droppings can be allowed to accumulate without detrimental effect and at considerable saving of labour. In case of diseases, such as Coccidiosis, the wire floors are especially valuable as a control measure. Hoppers for food and utensils for milk or water can at first be placed close to the house, but should be gradually moved away from it in order to encourage the birds to range and to prevent contamination close up to the shelter.

Ideal conditions for vigorous growth are afforded by this inexpensive shelter because the birds are provided with plenty of fresh air, there is no crowding, and sufficient protection is given except under extremely bad conditions.

THE FOOD AND FEEDING HABITS OF THE LAND-RAIL OR CORN-CRAKE

WALTER E. COLLINGE, D.Sc., F.L.S., M.B.O.U.,
Keeper of the Yorkshire Museum, York.

To those who take an interest in wild birds, particularly from the economic aspect, it has been apparent in recent years that the Land-Rail or Corn-Crake has gradually decreased in numbers in the south and south-west of this country. This bird is a summer visitor (a few are possibly resident) arriving during April and May and leaving us between August and October.

The diminution of any species of wild bird, unless it be wholly injurious, is to be regretted, but in this case the species is a distinctly beneficial one that should be welcomed and preserved by all connected with agriculture. Some account of its life-history and economic status may therefore be of use and interest.

Life-History and Habits.—The habitat of the Corn-Crake is chiefly rough pastures and low-lying meadows, occasionally corn fields. The nest is built practically wherever there is sufficient cover in long grass or rank weeds, and consists of a layer of dried grass in a slight depression of the ground. There are usually eight to ten eggs, but as many as 18 have been recorded. Possibly this larger number was the product of more than one hen. The egg colour is a pale greenish-grey or reddish-white, spotted with grey and rufous-brown. It is probable that in some districts two broods are reared, the first during May and the second towards the end of July or early in August, but generally the bird is single brooded. Incubation is carried out by the female alone, and occupies 17 or 18 days. The nestlings are fed for four or five days by the parents, after which the young birds look after themselves, but keep company with their parents for a while. The Land-Rail does not readily take wing, and when it does, flies but slowly. Its compressed body and long legs enable it to travel on the ground with remarkable rapidity, and if pursued and captured it will feign death.

Economic Status.—In view of the decrease of this species it has not been deemed advisable to destroy any large number of specimens. Many of those examined have been shot in error or accidentally.

Very little exact information is to be gleaned from published references as to the food. Miss Florence* examined only two specimens, which contained the remains of the heads of four weevils, many fragments of chitin, eggs and pieces of skin of *Tipula* sp., two corn grains, husks and fragments of cereal and three seeds of Spurrey (*Spergula arvensis*). Miss Hibbert-Ware† examined the contents of two gizzards which contained "chiefly vegetable remains, chitinous remains of water larvæ; water larvæ and chitin and tracheæ."

Witherby‡ states that the food is "mainly animal matter, though seeds of rushes and *Spergula* and fragments of weeds have been recorded. Insects consumed include coleoptera (weevils, longicorn beetles, etc.); diptera and their eggs, and orthoptera (*Forficula*, *Acridium*, etc.); also arachnida (*Epeira*); mollusca (*Helix* and *Limax*); horse-leech (*Hirudo*), etc."

Food Habits.—For the purpose of this investigation, thirty-three specimens have been available.

Animal Food.—Of the total food consumed during the period May to October (the last specimen was received on October 20) 82·5 per cent. is of an animal nature. Of this 58 per cent. consists of injurious insects, 7·5 per cent. of neutral insects, and 1 per cent. of beneficial insects; 5·5 per cent. of slugs and snails, 7·5 per cent. of earthworms, 0·5 per cent. of spiders, 1 per cent. of millipedes, and 1·5 per cent. of unidentified animal matter. Amongst the injurious insects surface larvæ (*Agriotes*, *Agriotis*, etc.) were plentiful, and the larvæ of the Crane Fly, better known as leatherjackets, constituted a large percentage, while the larvæ of the Common Earwig were also plentiful. Apart from the Lapwing and Black-headed Gull, we know of no bird that consumes such large quantities of Crane Flies (both larvæ and adults) as does this species. During recent years, this pest has increased enormously on grass land and, if for no other reason, farmers should see that the Land-Rail is afforded every protection.

Vegetable Food.—Vegetable food forms 17·5 per cent. of the total bulk of food, and consists chiefly of weed seeds, with grass, bits of weeds, etc., occurring occasionally (Fig. 1¶).

* *Trans. High. & Agric. Soc. Scotland*, 1912-1915.

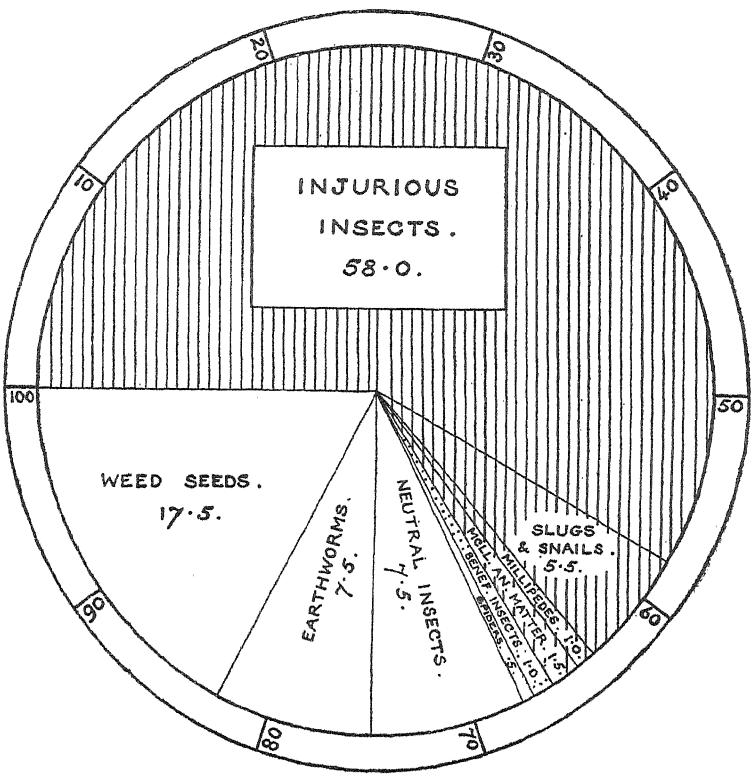
† *Essex Nat.*, 1923, xx, pp. 142-150.

‡ *A Practical Handbook of Brit. Birds*, 1920-1924.

¶ The portions shaded by longitudinal lines represent food that it is beneficial the birds should eat; those stippled, food that it is injurious the birds should eat; and the blank portions food of a neutral nature.

Summarizing these figures, we find that of the total consumption of food while in this country 66·0 per cent. constitutes a benefit to the farmer, 33·0 per cent. is of a neutral nature, and only 1 per cent. can be regarded as injurious.

It is very evident from the foregoing record that, during the six or seven months of the year spent by the Land-Rail in this country, it is a most valuable factor in the destruction of injurious insects. Most of the species it feeds upon are exceedingly difficult to attack by artificial means and the



Diagrammatic representation of the percentages of food of the Land-Rail or Corn-Crake.

writer has practically failed to find any injuries inflicted by it. The grains of corn, and husks and fragments of cereals, found by Miss Florence, were probably picked up in the stubble.

The serious decrease in recent years in the numbers of the bird visiting this country in the south, south-west and south midlands is much to be regretted, and investigations in hand will, it is hoped, throw some light upon the cause.

It has been suggested that its growing scarcity in this country is due to the mortality caused by the modern mowing machine, the more general use of the corn drill, the mortality due to telegraph and telephone wires, and shooting the birds in the autumn. None of these, however, can be held to account satisfactorily for the decrease geographically.

In conclusion, we have here the striking case of a most interesting bird, of great economic value, that spends six or seven months on the land just at a period when it can confer the maximum benefit upon agriculturists. It is, therefore, important that every protection should be afforded to so beneficial a species, and that sportsmen and others should be particularly careful not to destroy it.

* * * * * *

MARKETING NOTES

National Mark Eggs.—The National Mark Egg Scheme has now been in operation for two and a half years, and figures of the output of the authorized packing stations for the last two complete years are appended.

1929-1930				1930-1931			
Month	Total output of Packing Stations	Output under the National Mark	National Mark percentage of total output	Month	Total output of Packing Stations	Output under the National Mark	National Mark percentage of total output
1929	Millions	Millions	Pr.cent.	1930	Millions	Millions	Pr.cent
Aug. ..	14·8	9·6	65	Aug. ..	17·4	12·6	72
Sept. ..	14·7	9·2	63	Sept. ..	16·7	12·0	72
Oct. ..	11·2	7·5	67	Oct. ..	14·2	10·1	71
Nov. ..	8·5	5·9	69	Nov. ..	12·3	8·7	71
Dec. ..	10·8	7·1	66	Dec. ..	16·3	12·4	76
1930				1931			
Jan. ..	16·6	11·8	71	Jan. ..	21·5	16·0	74
Feb. ..	15·5	11·0	71	Feb. ..	21·9	17·0	78
Mar. ..	22·1	15·7	71	Mar. ..	31·6	24·3	77
April ..	24·4	17·6	72	April ..	34·6	25·0	72
May ..	26·0	18·1	70	May ..	32·4	23·4	72
June ..	21·0	14·7	70	June ..	31·5	23·5	74
July ..	20·0	14·2	71	July ..	26·1	20·0	77
TOTALS .	205·6	142·4	69	TOTALS .	276·6	204·9	74

The above table is interesting from the point of view of the evidence that it affords of the growing success of the National Mark Egg Scheme. For instance, in July, 1931, the output

of the stations was 26·1 million eggs, of which 20 million were packed under the National Mark, the latter representing an increase of 40 per cent. over the National Mark output in July, 1930. During the first seven months of this year, the National Mark output has been 44 per cent. greater than in the corresponding period of last year, whilst a further interesting point is the fact that although packers need only pack under the National Mark a minimum of one-third of their total output, the National Mark output is actually over two-thirds of the total supplies handled by the packing stations.

Egg prices are following their usual course at this time of the year and are at present steady, with a tendency to rise as the seasonal reduction in supplies proceeds, although they are at a somewhat lower level than they were last year.

The Annual Report of the Supplies Department of the London County Council reveals that the National Mark Scheme has resulted in the purchase by that body of a much greater number of English eggs than formerly.

The report states that " until the introduction of the National Mark Medium egg it was not possible to purchase many English eggs, but during the last six months of the financial year it was possible to purchase 1,840,200 English eggs out of a total quantity of 5,257,800 purchased." The report also expresses the belief that during 1931-32 the proportion of English eggs purchased will show an increase. There are general signs of a growing appreciation of the value of the scheme on the part of those responsible for provisioning large public institutions, and it is expected that more Public Authorities will take advantage of the facilities afforded by the scheme when making their contracts.

Among other developments, the Dorset Egg Producers (under the direction of Mr. F. T. Rowland), who have packing stations in Dorset, at Sturminster, Newton and Dorchester respectively, have acquired the business of the Yeovil Egg Packing and Producer Co-operative Co., Ltd., who have operated as authorized packers under the National Mark Egg Scheme since its inception. Supplies from the area served by the latter station will thus continue to be collected for packing under the National Mark.

National Mark Beef.—Revised Regulations, entitled the Agricultural Produce (Grading and Marking) (Beef) Regulations, 1931, came into force on July 20. These Regulations,

which revoke the Regulations of 1929, provide for the inclusion in the *Prime* and *Good* grades of certain young cattle possessing the desired characteristics, but hitherto excluded from the scheme owing to the phrasing of the Regulations, and for the grading and marking of home-killed Canadian cattle. The necessity for amending the 1929 Regulations was explained in the June and July issues of the JOURNAL. The high standards prescribed for National Mark Beef will be strictly maintained.

The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during July, 1930, and July, 1931, and the number of sides graded and marked for the four weeks ended August 15, 1931, were as follows :—

			Number of sides
	LONDON		
Weekly average	July, 1930		1,514
,, ,,	,, 1931		1,519
Week ended	July 25, 1931		1,599
,, ,,	August 1, 1931		1,561
,, ,,	,, 8, 1931		1,353
,, ,,	,, 15, 1931		1,582
	BIRKENHEAD*		
Weekly average	July, 1930		303
,, ,,	,, 1931		88
Week ended	July 25, 1931		159
,, ,,	August 1, 1931		158
,, ,,	,, 8, 1931		84
,, ,,	,, 15, 1931		118
	SCOTLAND*		
Weekly average	July, 1930		2,427
,, ,,	,, 1931		1,987
Week ended	July 25, 1931		1,049
,, ,,	August 1, 1931		1,072
,, ,,	,, 8, 1931		1,049
,, ,,	,, 15, 1931		1,093
	TOTAL LONDON SUPPLIES (All Sources)		
Weekly average	July, 1930		4,244
,, ,,	,, 1931		2,594
Week ended	July 25, 1931		2,807
,, ,,	August 1, 1931		2,791
,, ,,	,, 8, 1931		2,486
,, ,,	,, 15,		2,793
	BIRMINGHAM		
Weekly average	July, 1930		146
,, ,,	,, 1931		481
Week ended	July 25, 1931		493
,, ,,	August 1, 1931		507
,, ,,	,, 8, 1931		410
,, ,,	,, 15, 1931		527

* Sides consigned to London.

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

		Number of sides
LEEDS		
Weekly average	July, 1931 ..	466
Week ended	„ 25, 1931	540
„ „	August 1, 1931	335
„ „	„ 8, 1931	336
„ „	„ 15, 1931	385
BRADFORD		
Weekly average	July, 1931	340
Week ended	„ 25, 1931	368
„ „	August 1, 1931	378
„ „	„ 8, 1931	330
„ „	„ 15, 1931	308
HALIFAX		
Weekly average	July, 1931 ..	51
Week ended	„ 25, 1931	70
„ „	August 1, 1931	66
„ „	„ 8, 1931	50
„ „	„ 15, 1931	58

The weekly average of sides graded and marked in the London area showed a small decrease during July, mainly because smaller supplies of gradable beef were received.

The situation created by a number of senders of Scotch-killed beef who ceased to offer their beef for grading, as mentioned in recent numbers of the JOURNAL, remains substantially unaltered, although there was a slight and sustained increase in the number of marked sides received during July. There are indications that certain of the senders of Scotch beef who have recently been applying private marks to their beef have ceased to do so and are now sending their supplies to Smithfield unmarked. In a recent note issued to the Press by the Department of Agriculture for Scotland, farmers and their agricultural societies were urged in their own interests to support the Scottish National Mark Beef Scheme. The note points out that there is unquestionable evidence that the scheme has proved advantageous to the producer and has made known the true merits of Scotch beef to a wide public.

During July, unmarked Canadian sides of finest quality were in fair supply and commanded high prices. The effect of the arrangements made for the grading and marking of Canadian home-killed beef cannot yet be estimated.

The attitude of the Birmingham wholesalers towards the scheme remains unchanged, but the grading and marking service is being extended to a steadily increasing number of private slaughter-houses.

In a communication dated July 22, the Leeds Meat Traders' Association informed the Ministry that, as from July 25, the wholesalers would no longer have any meat graded but they would leave it optional to the purchaser to have the

meat graded if desired. This action was stated to have been taken on the grounds that, after a fair trial, the Scheme had secured no advantage to wholesale butchers, farmers or consumers. Arrangements were immediately made by the Ministry whereby retailers were enabled to obtain their usual supplies of home-killed beef.

National Mark Canned Fruit and Vegetables.—Two further applications for enrolment under the scheme, from the following prospective packers, have been approved :—

Mrs. K. M. Wintour, Pickering Cottage Preserves, Loose, near Maidstone.
S. Moore & Sons, Easterton, Wilts.

The total number of firms now packing under the National Mark amounts to 25, operating 32 factories.

All canning factories are still working at high pressure and there seems little doubt that previous forecasts that the total output of canned fruit and vegetables under the National Mark will be at least double that of last year, will be fully realized. The most notable increase is in the pack of fresh-picked peas, in the canning of which 10 factories have been engaged this season compared with 2 last year. The total pack of this commodity under the National Mark is probably three times as large as that of the previous season.

Among fruits, the pack of strawberries has been considerably larger, despite an unduly short season. Poor picking conditions occasioned by the bad weather have affected the packing of raspberries and loganberries.

Two further varieties of peas—viz., " Chemin Long " and " White Admiral "—have been added to the list of varieties of peas approved for canning under the National Mark.

National Mark Cider.—Certificates of authorization have recently been issued to the following additional approved packers, those marked with an asterisk being bottlers :—

*Jewsbury & Brown, Ltd., Ardwick Green, Lancs.
*R. C. Lorimer, Norfolk Street, Kings Lynn, Norfolk.
*George Raggett & Sons, Ltd., 3 Southwark Bridge Road, London, S.E.1.
*Taplow & Co., "Whitehall," Stratford, London, E.15.
*Ushers' Wiltshire Brewery, Ltd., Trowbridge, Wilts.
*Victoria Wine Co. Ltd., 12 to 20, Osborn Street, London, E.1.
*Watney, Coombe, Reid & Co. Ltd., Stag Brewery, Pimlico, London, S.W.1.
Arnold & Hancock, Ltd., The Brewery, Wiveliscombe, Somerset.

The total number of packers authorized in the scheme is now 58, consisting of 34 manufacturers and farm cider makers, 2 associations of farm cider makers and 22 bottlers. Four further applications are at present under consideration.

National Mark Wheat Flour.—The following firms have recently been enrolled as authorized repackers :—

Armitage Bros., Victoria Street, Nottingham.
Brewhurst Milling Co., Ltd., Loxwood, Sussex.
C. D. Dearlove, Binfield Heath, Oxford.
Wm. C. Gay, Lea, near Malmesbury, Wilts.
F. Hickling, Owmby, Lincs.
Norton & Norton, 15 North Quay, Great Yarmouth.
Trumps Stores, Ottery St. Mary, Devon.

The following firms have been enrolled as authorized millers :—

T. A. Aylward & Sons, Dunbridge, Hants.
T. C. Greensmith & Sons, Burton-on-Trent.
W. H. Smith & Sons, Wharf Mills, Buckingham.

The total number of millers and repackers authorized to apply the National Mark to All-English Wheat Flour is now 234; a complete list of the names and addresses may be obtained on application to the Ministry.

Publicity for National Mark Produce.—In connexion with the Ministry's marketing demonstration at the Royal Lancashire Agricultural Show, Liverpool (July 30 to August 3), advertisements of the National Mark were inserted in local newspapers. Other press publicity carried out during August included advertisements of National Mark beef in newspapers circulating in the Birmingham and Leeds areas in continuation of the general programme of publicity in those areas; of National Mark cider in Birmingham newspapers; and of National Mark beef, cider, fruit and canned fruits in selected trade journals. The special series of advertisements in certain women's journals was also continued.

It has been found that one of the most valuable means of acquainting housewives in the Birmingham and Leeds areas with the aims and principles of the National Mark scheme has been through the lectures with special reference to National Mark beef that have been given by trained women speakers to various women's organizations. Since they were commenced in Birmingham a year ago, over 250 lectures have been delivered to a total of over 16,000 women. A Birmingham retail butcher has stated that, as a result of a recent lecture, 14 new customers asked for National Mark beef in his shop alone on the following Friday and Saturday. In the Leeds area, 40 lectures have been given in the last six months to nearly 1,500 women.

Additional publicity for National Mark beef in Leeds was arranged during August, including advertisements in the local trams, special posters carried by sandwichmen, posters on vans, and advertising slides in cinema halls. A certain number

of these halls also displayed, free of charge, a new " cartoon " film that has been prepared for the Ministry to advertise National Mark Beef.

Following a conference with authorized canners of National Mark canned fruits and vegetables held at the Ministry on July 28, at which the Minister of Agriculture presided, supported by the Rt. Hon. Tom Johnston, M.P., Lord Privy Seal, arrangements have been made for an experimental canvass in certain towns in Lancashire and in Scotland on behalf of National Mark canned fruits and canned vegetables, to take place in October, November and December, under the joint auspices of the Empire Marketing Board, the Department of Agriculture for Scotland and the Ministry. The canvass will be conducted by the Empire Marketing Board on somewhat similar lines to those adopted in connexion with the successful Empire butter campaign carried out by the Board in the first four months of this year. In the first instance, the wholesale trade in the town concerned will be advised of the campaign to follow in order that they may be ready to respond to retail inquiries. The Board's canvassers will then interview potential retailers of National Mark goods and endeavour to persuade them to stock and sell National Mark canned fruits and vegetables. The consumer will be approached by means of advertisements inserted in local newspapers. This experimental canvass will be watched with much interest.

By the courtesy of *The Times* newspaper, the Ministry has been able to reproduce in leaflet form the valuable article contributed to that journal on May 25, 1931, by Professor B. T. P. Barker, Director of the National Fruit and Cider Institute, in which he reviewed the history of cider as a national beverage and dealt with the latest development in the English cider industry, viz., the application of the National Mark to cider of standard quality made from home-grown fruit. Copies of the leaflet (Marketing Leaflet No. 22c) may be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Displays of National Mark and other Home Produce.—The Ministry's National Mark Shop at 1, Burlington Gardens, London, W., which was opened on June 24, closed its doors on August 21. The experiment of holding a prolonged exhibition in the heart of the West End of London has been amply justified by results. Inquiries by visitors from all parts of the country have been numerous, and much useful

information on the National Mark movement has been disseminated. During the last month, distinguished visitors to the shop have included H.R.H. the Duchess of York, the Earl of Harewood, Miss Ishbel MacDonald, Mrs. Stanley Baldwin, Mr. Lloyd George, Dame Margaret and Miss Megan Lloyd George.

The Empire Marketing Board have taken a temporary lease of shop premises at Palatine Buildings, The Promenade, Blackpool, which are being occupied by the different countries of the Empire for successive fortnights as in the case of previous shops at Glasgow and Birmingham. The Ministry commenced a fortnight's occupation on August 31 for the purpose of a display of English and Welsh produce that has been arranged by the Ministry in conjunction with the National Farmers' Union. A further fortnight has been allocated to the Ministry from September 28 to October 10, when National Mark produce will be displayed.

Marketing Demonstrations.—The Ministry's summer programme of marketing demonstrations at agricultural shows came to an end with the Royal Lancashire Show at Liverpool, July 30-August 3. As at the other ten shows visited during the season, the demonstration consisted of honey- and cheese-marketing demonstrations and of a display of National Mark produce.

The following programme has been arranged for the coming autumn :—

Show	*Place*	*Period*	*Demonstration*
Home Crafts and Gardens Exhibition (National Show of Bees and Honey)	Crystal Palace	Sept. 9-12	Honey
Dairy Show	Agricultural Hall	Oct. 20-23	Cheese, Honey and National Mark Display.
Yorkshire Potato Show	Leeds	Oct. 27	Organization of Potato Marketing, Cookery Demonstration and National Mark Display.
Holland County Potato Show	Spalding	Oct. 29	Organization of Potato Marketing.
Imperial Fruit Show	Manchester	Oct. 30-Nov. 7	Fruit, Canned Fruit, Cider and Honey.
Brewers' Exhibition	Agricultural Hall	Oct. 31-Nov. 6	Cider.

Show	*Place*	*Period*	*Demonstration*
Norwich Fatstock Show	Norwich	Nov. 19-21	Organization of Potato Marketing.
Birmingham Fatstock Show	Birmingham	Nov. 28-Dec. 3	Organization of Potato Marketing and National Mark Beef.
Smithfield Show	Agricultural Hall	Dec. 7-11	Do.

The Marketing of Sheep, Mutton and Lamb.—There has recently been issued, as an addition to the Ministry's Orange Books, a "Report on the Marketing of Sheep, Mutton and Lamb."* This report, like others in the series, is based on a comprehensive investigation, by the Ministry's officers, of the methods of marketing practised in this country, comparisons being made with practices abroad.†

Among the main recommendations of the report are (*i*) the need for a more informative system of price recording for sheep and lambs, (*ii*) the desirability of better control of supplies of sheep going on to the market, (*iii*) the establishment of a National Mark grading scheme for mutton and lamb carcasses, similar in principle to that which is operating successfully for beef, and (*iv*) the rationalization of slaughtering in this country.

With regard to price recording, it is pointed out that existing systems do not allow the effects on prices of quality and carcass weight—both highly important but independent price determinants—to be distinguished. The report suggests a schedule for the reporting of fat sheep prices, in which various weight categories are subdivided into quality classes corresponding with the carcass grades suggested later in the report. This schedule has now been adopted as a basis for the weekly broadcasting of prices of fat sheep and lambs on several markets in England, under the Ministry's auspices.

Co-ordination of supplies with demand by livestock producers' organizations is highly developed in the United States (for livestock) and in New Zealand (for meat). The structure and activities of marketing organizations in these countries are outlined in the report. It is suggested that the most promising line of development in this country may be the sale, by pro-

* Economic Series, No. 29. H.M. Stationery Office, Price 6*d*. net.

† Reports on the trade in other kinds of live stock and meat have already been issued—viz., Refrigerated Beef, Mutton and Lamb (Economic Series, No. 6), Pigs (Economic Series, No. 12), Pork and Bacon (Economic Series, No. 17) and Cattle and Beef (Economic Series, No. 20). The veal trade and the trade in hides and skins will be the subjects of separate reports.

ducers' organizations, of fat sheep to butchers in urban markets on the basis of dead weight and carcass grade. Farmers' regional buying and selling agencies working in conjunction with one another and with livestock traders might also, it is suggested, effect improvements in the transfer of store sheep and lambs from breeding to feeding areas.

The system of grading mutton and lamb carcasses and of application of the National Mark, which is suggested for the consideration of the various interests concerned, has as its objects those which the National Mark beef scheme has shown to be possible of attainment—to give the consumer of home-killed meat an indication of the origin and a guarantee of the quality of the meat he buys; to facilitate the task of the retail distributor in obtaining uniformly reliable supplies; to enable the producer of the high-quality article to reap, indirectly, the due reward for his product, and thus to stimulate the production of better quality meat; to give a distinguishing mark to high-class wares; and, last but not least, to afford a basis for publicity on behalf of the home-killed product similar to that enjoyed by its overseas competitors.

The condition of slaughtering facilities in this country is a subject which has come to the fore in recent years. Attention was drawn in the Ministry's *Report on the Marketing of Cattle and Beef* * to the deficiencies of the existing system or, rather, lack of system. These deficiencies are re-emphasized in the present report. Briefly, the position is that the diffusion of a large proportion of the slaughterings over the 16,000 or so private slaughterhouses that exist in this country, and the lack of any central control of slaughtering operations in practically all public abattoirs, deprives the home industry of the advantages of mass production methods that are enjoyed by its overseas competitors. The whole question of centralization of slaughtering in Great Britain is at present under consideration by an official Committee.

The Report concludes: "Whatever changes may be necessary in this direction or in that of more rational marketing can only come about as a result of careful planning. It is certain that the marketing problems of the livestock industry cannot be completely solved until livestock producers, as such, are organized for marketing purposes. Producers would, therefore, be well advised to consider how best to make use of the facilities which Parliament has now placed at their disposal in the Agricultural Marketing Act, 1931. Meanwhile,

* Economic Series, No. 20, Chapter XI.

a task of immediate urgency is that of standardizing the home product, and there seems to be no reason why a movement should not be made at once to prepare for an experiment, under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, in the grading and marking of home-killed mutton and lamb on somewhat similar lines to that which is operating successfully for beef."

Agricultural Produce (Grading and Marking) Amendment Act, 1931.—Among the various measures affecting agriculture to which the Royal Assent was given on Friday, July 31, is the Agricultural Produce (Grading and Marking) Amendment Act, 1931. This Act, which contains only five sections, was passed through Parliament with the agreement of all parties to meet a general desire that the Agricultural Produce (Grading and Marking) Act, 1928, under which the National Mark schemes have hitherto been introduced, should be extended to enable fishery products to be brought within its scope, and also to enable certain products manufactured wholly or mainly from agricultural or fishery produce to receive the application of the National Mark if circumstances justify this course. Section 2 of the Act accordingly enacts that agricultural and fishery produce includes respectively all produce of agriculture and horticulture and of the fishing industry, all articles of food or drink wholly or partly manufactured or derived from any such produce as aforesaid, and fleeces and the skins of animals.

The first result of this extension of the Act will probably be the extension of the National Mark to jam made from home-grown fruit. An investigation is already being undertaken by the Ministry of Agriculture, preparatory to the formulation of a National Mark scheme for jam, and it is hoped that it will be practicable to introduce the scheme in time for its application to jam made in 1932.

Section 4 of the Act contains new provisions to protect the National Mark from improper use. It provides penalties applicable to any person who uses, in connexion with any article whatsoever, any mark or description of such a character or in such a manner as to be calculated, by reason of the resemblance of that mark or description to a grade designation mark or to any prescribed part of a grade designation mark (*e.g.*, the National Mark), or by reason of that mark or description being or incorporating the words "national mark" or otherwise, to lead to a false belief that the article is an article which has been brought within the grading and marking provisions of

a statutory National Mark scheme. This Sub-section is designed to prevent the use of the National Mark design or words in connexion with non-agricultural products, so that it would be unlawful for a person to apply the National Mark design or words to such things as pocket-knives, fountain-pens, cement or steel rails, In this way, the advertising and selling force of the National Mark is reserved for such products of home agriculture and of home fisheries as are the subject of grading regulations under the principal Act.

Sub-section 2 of Section 4 strengthens the penalties for improper use of the National Mark in connexion with all products, providing that any person who uses in connexion with any article whatsoever any mark of such a character or in such a manner as to be calculated, by reason of the resemblance of that mark to a grade designation mark (*e.g.*, the National Mark), to deceive, shall, unless he proves that he acted without intention to deceive, be liable on summary conviction to imprisonment for a term not exceeding three months or to a fine not exceeding twenty pounds, or, on conviction on indictment, to imprisonment for a term not exceeding two years or to a fine, or to both imprisonment and fine.

Agricultural Marketing Act, 1931.—On July 31, 1931, the Royal Assent was given to the Agricultural Marketing Act, which gives to agricultural producers wide powers to secure the efficient organization of the marketing of their produce. In view of the far-reaching character of the measure and its importance to all who are concerned in any way in the production and marketing of agricultural produce, a Report dealing with the Act has been prepared and issued.

This publication, which appears as one of the Ministry's Orange Books on marketing,* gives an exposition of the chief provisions of the Act. The subjects dealt with include the procedure relating to the submission and approval of marketing schemes, the administration of schemes, the powers and duties of marketing boards, financial arrangements and public and producers' safeguards. The Act itself appears as an appendix to the Report, while, for the further convenience of readers, the Report is fully indexed and the text itself is annotated throughout with references to the provisions of the Act. To those who wish to become familiar with the Act, the report is useful if not indispensable.

Marketing Grants.—Grants are made by the Ministry, out of funds made available by the Empire Marketing Board,

* Economic Series, No. 33. H.M. Stationery Office. Price 6*d.* net.

for the improvement of marketing of agricultural produce. An application for a grant of this nature has to be supported by evidence indicating that the venture contains some novel element and that it involves a commercial risk that would not normally be accepted by the applicant. It is usually required also that the venture should show prospects of becoming self-supporting within a reasonably short period.

Alternatively, grants may be made in aid of specific pieces of marketing research undertaken on the Ministry's behalf, or in return for certain services.

The last statement of grants made appeared in the issue of this JOURNAL for March, 1931. The following further grants were made by the Ministry during the half-year ended June 30, 1931 :—

Amount	*To whom payable*	*Purpose*
*£39 17*s.* 2*d.* for 1930 season	Norfolk Fruit Growers, Ltd.	Costs of inspection of graded black currants marketed under an experimental scheme
*£300 for 1 year to March 31, 1931	National Institute of Agricultural Botany, Cambridge	Expenses in connexion with the testing of seeds for export
*£800 for 1 year to January 31, 1932	National Mark Egg Central, Ltd.	To assist establishment of a central federation of egg packers, and provide for propaganda and demonstrations
£100 for 1 year to March 20, 1932	Somerset Cider Growers' Federation	Expenditure on services in connexion with the National Mark scheme for cider
*£42 for 1 year to March 31, 1932	Wiltshire Egg Producers, Ltd.	To provide costings data in respect of egg packing station
* Do. do.	Norfolk Egg Producers, Ltd.	Do. do. do.
* Do. do.	Gloucestershire Marketing Society, Ltd.	Do. do. do.
*£688 for 1 year to July 31, 1932	Oxford University (Agricultural Economics Research Institute)	Investigations into the marketing of farm produce

* These are in continuation of grants previously made.

Union of South Africa : Grading and Marking of Cheese.—New regulations for the compulsory grading and marking of cheese intended for export were made on April 24, 1931. The regulations define three quality grades, designated first grade, second grade and third grade.

A scale of points for flavour, quality, colour, salting and finish is laid down, and the cheese is graded in accordance with the total number of points scored.

Standard weights are prescribed for cheddar and sweet milk cheese, which must be packed in crates or cases made to standard specifications. Precise instructions are also given as to the manner of branding all kinds of cheese and containers, the method of packing and the temperatures at which cheese must be cold-stored before export and on shipment.

Provision is made for an inspection service by the Minister of Agriculture to execute the Regulations, and a fee of 2*d.* per crate is payable in respect of all cheese submitted for grading or inspection.

Tasmanian Barley Growers : Interesting Marketing Developments.—During the past year Tasmanian barley growers have taken steps that should be of considerable interest to growers in this country, not only as affecting the supply of barley on our home market, but also as an object lesson in the standardization of barley quality and the organization of barley marketing.

In 1928, a number of barley growers in the principal cereal district in Tasmania were dissatisfied with the unsatisfactory market conditions for the barley crop in which there was no export trade. Since then, steps have been taken to develop a marketing policy that enables Tasmanian growers to place their barley in this country.

Foundation of the Company.—In August, 1929, the Tasmanian Barley Growers, Ltd., was incorporated, and the Directorate was formed of six barley growers and two business men interested in the marketing of barley.

The organization does not attempt to fix prices but sells on the best basis possible on the world market ; no expensive staffs are maintained.

Growers' Contracts.—The Company handles all the barley grown by its members, who contract to supply their barley to the Company for three years. No regulation is imposed as to the quantity of barley to be grown, and each grower is entitled to use the barley grown on his own farm if he so desires but undertakes not to sell it except through the Company.

Seed Selection.—The Directors in the first instance set out to ascertain which was the best seed and the most suitable variety in respect of quality. They have retained each year a large quantity of the best seed grown during the year, for distribution among their members. They have thus eliminated inferior barleys and practically standardized approved varieties. Samples of pure seed of Plumage Archer

and Spratt Archer have been imported from Great Britain and propagated under strict supervision, to ensure the maintenance of its purity.

Standard Grades.—It was found to be very difficult to arrive at standard grades of barley, because the purchaser had been in most cases the sole judge of barley quality. By careful investigation, and more or less as a result of the standardization of the varieties grown, it has been found possible to fix standards.

There are six grades of malting barley and one for feed barley, and every sack of every consignment is tested for grading purposes. This step was found to be absolutely necessary, since two and even three grades of barley are produced in the same field owing to variations in the soil and other reasons. The grading as carried out by the Company has created confidence amongst the buyers and the growers. The actual grading is done in the merchants' stores as the barley is received, but this is not the final grading as all samples have to be passed and certificates given by the grader appointed by the Tasmanian Government.

Results.—The results of the past season's operations have been a revelation as to what can be done in a very short time to raise the quality of this product. In spite of the fall in world prices, Tasmanian growers have received as high a price this season as last. This was largely on account of the improved quality. The Company has completed the shipment of approximately 1,000 tons of barley to England this season, and the reports from maltsters and brewers as to its quality suggest that the Tasmanian product more closely resembles British grown barley than the general run of imports.

These results have been brought about by sound organization, careful grading and the standardization of the crop on the basis of approved varieties of seed.

Successful Publicity for German Butter.*—Publicity can only be successful if the product advertised is of irreproachable quality and is all that is claimed for it in the advertisements; this applies especially to publicity directed towards ousting a product of one origin from the market by a similar product of another origin. It is chiefly because these requirements are still not met in a large number of agricultural products that costly advertising campaigns have failed. On the other hand, the possibility of successful publicity for genuine high-

* Translation from *Blätter für Landwirtschaftliche Marktforschung*, Berlin, June, 1931.

grade produce is proved by the result of an experimental publicity campaign carried out for German high-grade butter by one of the biggest chain stores in the Berlin butter trade (Butter-Nordstern). Its aim was to show the German consumer that the preference given to foreign butters is not justified, as German butter production has probably made the greatest progress in respect of quality.

In planning the campaign, the following requirements were laid down. The butter had to be

(1) up to the standard of the Danish butter sold on the Berlin market,

(2) constantly available in adequate quantities,

(3) of consistent quality, and

(4) able to compete in price with good foreign butter.

After careful consideration, especially with regard to the second and third requirements, the choice fell upon Schleswig-Holstein National Mark Butter. When the Company had concluded the necessary contracts with the Schleswig-Holstein dairies, in order to make certain of their ability to deliver, it began the publicity campaign by sending 80,000 picture postcards from Schleswig-Holstein to housewives who were regular customers. The text was to this effect :—A friend who is spending her summer holiday in Schleswig is delighted with the excellent Schleswig-Holstein butter, and points out that it can be bought in Berlin at the local branches of the Nordstern Company. To supplement and strengthen the campaign, 100,000 circulars were distributed to householders in the neighbourhood of the branches, and advertisements were inserted in 20 of the most popular papers. The window displays of all the branches were exclusively devoted to Schleswig-Holstein butter, and the saleswomen were provided with white caps bearing the Schleswig-Holstein colours. During the period of the campaign, only German butter was sold in all the branches. The sales staff was instructed to draw the attention of customers who asked for Danish butter to the special merits of German butter. Anyone insisting on buying Danish butter had to buy at another shop.

It is interesting, as a point of sales psychology, that the working-class and middle-class customers willingly availed themselves of the opportunity to buy good German butter, but the "intellectual" part of the population often preferred to leave the shop and buy Danish butter elsewhere.

It is estimated that the campaign succeeded in increasing the total turnover of butter by 10 per cent. Considering that previously a substantial part of the turnover consisted of sales of Danish and other foreign butters, and that the increase was achieved with German butter only, the prospects of success for a systematically executed publicity campaign for German high-grade products appear in an even more favourable light.

The chain stores are responsible for a considerable part of the butter supply of the great German consuming centres. All of them, if they undertook publicity for German high-grade butter on the above or similar lines, distributing among themselves the responsibility for advertising the various producing districts, could open up valuable new sales outlets, provided that German agriculture puts this high-grade butter at their disposal in adequate quantities.

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AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1931

ACREAGE UNDER CROPS AND GRASS AND NUMBERS OF LIVE STOCK ON HOLDINGS ABOVE ONE ACRE IN EXTENT IN ENGLAND AND WALES AS RETURNED BY OCCUPIERS ON JUNE 4, 1931.

(*The figures for* 1931 *are subject to revision.*)

CROPS AND GRASS

Distribution	1931	1930	Increase		Decrease	
	Acres	*Acres*	*Acres*	*Per cent.*	*Acres*	*Per cent.*
TOTAL ACREAGE under all CROPS and GRASS ..	25,278,000	25,380,000	—	—	102,000	0·4
*ROUGH GRAZINGS ..	5,314,000	5,294,000	20,000	0·4	—	—
ARABLE LAND ..	9,582,000	9,833,000	—	—	251,000	2·6
PERMANENT GRASS :						
For Hay ..	4,784,000	5,051,000	—	—	267,000	5·3
Not for Hay	10,912,000	10,496,000	416,000	4·0	—	—
TOTAL ..	15,696,000	15,547,000	149,000	1·0	—	—
Wheat	1,197,000	1,346,000	—	—	149,000	11·1
Barley	1,029,000	1,020,000	9,000	0·9	—	—
Oats	1,652,000	1,779,000	—	—	127,000	7·1
Mixed Corn ..	122,300	130,700	—	—	8,400	6·4
Rye	32,700	44,000	—	—	11,300	25·7
Beans, harvested as corn ..	145,500	161,500	—	—	16,000	9·9
Beans, picked or cut green ..	12,600	14,400	—	—	1,800	12·5
Peas, harvested as corn ..	75,200	77,900	—	—	2,700	3·5
Peas, picked or cut green ..	57,400	56,400	1,000	1·8	—	—
Potatoes ..	446,900	424,700	22,200	5·2	—	—
Turnips & Swedes	620,600	671,400	—	—	50,800	7·6
Mangold ..	270,700	288,300	—	—	17,600	6·1
Sugar-Beet ..	233,300	347,300	—	—	114,000	32·8
Cabbage for fodder, Kohl-rabi and Rape ..	125,600	134,400	—	—	8,800	6·5
Vetches or Tares	64,100	75,100	—	—	11,000	14·6
Lucerne.. ..	46,100	39,800	6,300	15·8	—	—
Mustard for seed	22,600	26,300	—	—	3,700	14·1
Cabbage for human consumption ..	35,700	30,600	5,100	16·7	—	—
Brussels sprouts	35,700	26,300	9,400	35·7	—	—

* Mountain, Heath, Moor, Down and other rough land used for grazing.

CROPS AND GRASS—*continued*

Distribution	1931	1930	Increase		Decrease	
	Acres	*Acres*	*Acres*	*Per cent.*	*Acres*	*Per cent.*
Cauliflower or Broccoli ..	15,800	14,600	1,200	8·2	—	—
Carrots	9,500	9,000	500	5·6	—	—
Onions	1,500	2,000	—	—	500	25·0
Celery	7,300	6,400	900	14·1	—	—
Rhubarb ..	7,800	7,400	400	5·4	—	—
Linseed	3,200	3,900	—	—	700	17·9
Hops	19,600	20,000	—	—	400	2·0
Small Fruit ..	62,000	66,200	—	—	4,200	6·3
Orchards ..	244,500	247,000	—	—	2,500	1·0
CLOVER and ROTATION GRASSES:						
For Hay ..	1,726,000	1,595,000	131,000	8·2	—	—
Not for Hay	855,000	828,000	27,000	3·3	—	—
TOTAL ..	2,581,000	2,423,000	158,000	6·5	—	—
BARE FALLOW..	356,000	294,000	62,000	21·1	—	—

The returns made as on June 4, 1931, by occupiers of holdings of agricultural land exceeding one acre in extent in England and Wales covered a total area of 30,592,000 acres, and reveal a further net reduction of agricultural land since June, 1930, of 82,000 acres, the area under crops and grass having decreased by 102,000 acres to 25,278,000 acres, while the area of rough grazings has increased by 20,000 acres to 5,314,000 acres. The arable acreage returned was 9,582,000 acres, showing a reduction since June, 1930, of 251,000 acres, and was accompanied by an increase of 149,000 acres in the area under permanent grass, which was 15,696,000 acres. The portion of the arable area returned as bare fallow amounted to 356,000 acres, as compared with 294,000 acres in 1930, and the area actually under crops in June, 1931 (excluding clover and rotation grasses), was 471,000 acres less than last year.

There was a reduction of 305,400 acres in the total area under corn crops (including beans and peas harvested as corn). There were heavy reductions in the areas under wheat and oats, and the acreages of the remaining crops were also reduced with the sole exception of barley, which showed a trifling increase. The potato acreage, which was reduced last year by 94,000 acres, shows some recovery, the acreage in 1931 being 22,200 acres more than in 1930. The area under roots shows a further reduction of 68,400 acres, and the sugar beet acreage, which increased in 1930 by over 50 per cent., has suffered a loss of 114,000 acres (32·8 per cent.). The area devoted to vegetables as a whole shows an increase, onions alone showing a small decrease, while the fruit acreage has been reduced by 6,700 acres, the greater portion of which is in the area under small fruit.

The acreage returned as under hops was 19,600 acres or 400 acres less than in 1930.

Cereals.—The net reduction in the acreage under the principal cereal crops—wheat, barley, oats and mixed corn—was 275,400 acres,

a negligible increase in the barley acreage being the only exception to heavy reductions in the acreages under the other three cereals. The wheat acreage has been reduced by 149,000 acres (11·1 per cent.) and at 1,197,000 acres is easily the lowest on record. A decrease was shown by all except five counties, and among these latter the only increase of note was 3,600 acres in Norfolk. The reduction in the wheat acreage was relatively heaviest in the East Midland Division, which lost nearly 30,000 acres (17 per cent.) of its 1930 acreage. In the North Eastern Division the net decrease was 19,000 acres (6 per cent.), Lincolnshire alone returning 20,000 acres less than in 1930. There was also a reduction of 42,000 acres (12 per cent.) in the Eastern division, Essex accounting for 13,800 acres of this decrease.

The barley acreage shows a very small increase of 9,000 acres (0·9 per cent.), and at 1,029,000 acres is the lowest on record except for that of the previous year. Extensions of barley acreage were almost confined to the Eastern and North Eastern divisions, the former adding 19,000 acres (8 per cent.) to its previous year's acreage, and the latter 14,000 acres (4 per cent.). The Norfolk barley area was increased by 10,000 acres, and the Suffolk area by 8,000 acres, while Essex and Yorks E.R. showed increases of 6,000 acres and 4,000 acres respectively.

The decrease in the acreage under oats was 127,000 acres (7 per cent.), the total acreage returned as under this crop being 1,652,000 acres, and the lowest on record with the exception of 1874.

Only one county (Isle of Ely) showed an increased acreage under oats. The reductions were actually and relatively heavier in the Eastern and South Eastern divisions, which lost 24,000 acres and 20,000 acres respectively, a decrease of 11 per cent. in each case. The North Western Division also lost 20,000 acres, the reduction in this division being 8 per cent.

The acreage under mixed corn was 122,300 acres, which shows a reduction of 8,400 acres, or about equal to the decrease recorded last year. In the South Western Division, which returns just about half the acreage under mixed corn, the reduction amounted to 3,800 acres (7 per cent.). The rye acreage of 32,700 acres returned this year is, with the exception of 1928, the lowest on record. The reduction shown as compared with last year's acreage is 11,300 acres or 25·7 per cent. Decreases were shown by the great majority of counties, and the net losses in the North Eastern, Eastern and Northern divisions, which contain the main rye growing areas, ranged from 2,000-3,000 acres.

Beans and Peas.—The total area under beans was 158,000 acres as compared with 176,000 acres in 1930, the reduction of 18,000 acres being about 10 per cent. The actual decrease is mainly in the area to be harvested as corn, which at 146,000 acres is 16,000 acres less than in 1930. About two-thirds of the acreage under this crop is to be found in the Eastern, North Eastern and East Midland divisions, and the reductions shown in these divisions were 6,000 acres, 5,000 acres and 2,000 acres respectively. Beans to be picked green accounted for 12,600 acres or 1,800 acres (12·5 per cent.) less than in 1930. The total acreage under peas is 133,000 acres or 1,700 acres (1·3 per cent.) less than in the previous year. This reduction is due to a decrease of 2,700 acres (3·5 per cent.) in the area to be harvested as corn, the area of peas to be picked green showing an increase of 1,000 acres (1·8 per cent.).

Potatoes.—The acreage under potatoes, which in 1930 was the smallest since 1910, was expanded this year to 447,000 acres, the addition being 22,000 acres (5·2 per cent.). The acreage under this

crop, however, is still lower than in any other year since 1916. The increase shown this year is confined to England, the total acreage in Wales being practically the same as in 1930. Two-thirds of the additional acreage was provided by counties in the Eastern and North Eastern divisions, the Isle of Ely adding 4,000 acres and Lincolnshire 6,000 acres, while Essex and Norfolk also showed increases of 1,000 acres. Outside these two divisions the largest increase was one of 1,000 acres in Cheshire.

Sugar Beet.—The striking increase of 117,000 acres (over 50 per cent.) recorded in the acreage under sugar beet in 1930 has been followed by a reduction this year of 114,000 acres (32·8 per cent.), the area returned as under this crop being 233,000 acres. The main sugar beet areas are in the Eastern and North Eastern divisions, and these two divisions together account for a reduction of about 85,000 acres which almost eliminates the increase recorded in these areas last year. In individual counties the greatest losses shown were 33,000 acres in Norfolk, 17,000 acres in Suffolk, 13,000 acres in Lincolnshire, and 10,000 acres in the Isle of Ely.

Fodder Roots.—The area under turnips and swedes amounted to 621,000 acres, involving a reduction of 51,000 acres (7·6 per cent.), as compared with 1930 when the area was the lowest ever recorded. Except for quite negligible increases in one or two counties in the Eastern division, reductions were general throughout the country. The heaviest decreases were 19,000 acres in Yorkshire; 6,000 acres in Lincolnshire; 3,000 acres in Hampshire and 2,500 acres in Norfolk. The area under mangolds was returned as 271,000 acres, and shows a reduction of 18,000 acres (6·1 per cent.) from that of 1930. The acreage under this crop is the lowest since 1868. A small increase was shown by all the counties in the Northern division, but otherwise practically all counties shared in the reduction. The greatest decreases were 1,800 acres in Essex; 1,600 acres in Norfolk and 1,500 acres in Lincolnshire.

Vegetables.—All vegetables for which returns of acreage are collected were grown on increased areas with the exception of onions which showed a reduction from 2,000 acres in 1930 to 1,500 acres this year. Cabbage for human consumption was being grown on 35,700 acres, or 5,000 acres more than in 1930. The area under brussels sprouts has increased from 26,000 acres to 35,700 acres, and the acreage of cauliflower and broccoli was augmented by 1,200 acres to 15,800 acres. Carrots show an increase of 500 acres, while the acreages under celery and rhubarb were increased by 900 acres and 400 acres respectively.

Other Crops.—There was a decrease of 9,000 acres in the area under fodder cabbage, kohl-rabi and rape, and of 11,000 acres in that under vetches and tares. Lucerne was being grown on an area greater by 6,300 acres, and the area under mustard for seed was reduced by 3,700 acres. The hop acreage shows little change, the acreage returned amounting to 19,600 acres as compared with 20,000 acres in 1930. It must be remembered, however, that the acreage actually picked last year was substantially smaller.

Fruit.—The fruit acreage shows more variation than last year. Whereas in 1930 the total acreage differed from the previous year only by about 100 acres, there is a total loss in the fruit acreage this year of 6,700 acres, of which 4,200 acres were from the area under small fruit, and 2,500 acres from the orchard acreage. The reduction in orchard acreage was most pronounced in Middlesex which showed

a decrease of 700 acres, and in the South Eastern and West Midland divisions which showed net reductions of 600 acres and 1,200 acres respectively. In the latter division Worcester returned 500 acres less, and Hereford 360 acres less than in 1930. The most notable changes in the acreage under small fruit were in Kent, which showed a reduction of 1,500 acres, and Norfolk, with a reduction of 600 acres.

Clover and Rotation Grasses and Meadow Hay.—As compared with last year there was an addition of 158,000 acres to the total area under clover and rotation grasses which was 2,581,000 acres; of these 1,726,000 acres, 131,000 acres more than in 1930, were returned as intended for hay.

The acreage of meadow hay was returned as 4,784,000 acres, or 267,000 acres less than last year, and the total area intended for hay in 1931 amounted, therefore, to 6,510,000 acres or 136,000 acres less than in 1930.

Bare Fallow.—The area returned as being left as bare fallow was 356,000 acres, the increase shown as compared with last year being 62,000 acres (21·1 per cent.).

LIVE STOCK

There were general increases in the numbers of live stock on agricultural holdings on June 4, 1931, with the exception of horses which, with a further reduction of 2·4 per cent., continued the decline recorded in each of the past 10 years. The total number of cattle shows an increase of 3·7 per cent. Sheep increased in number by 8·8 per cent., while pigs showed an addition of 20·2 per cent.

CATTLE

	1931	1930	Increase		Decrease	
	No.	*No.*	*No.*	*Per cent.*	*No.*	*Per cent.*
Cows and Heifers in milk ..	2,042,500	2,033,400	9,100	0·4	—	—
Cows in calf, but not in milk ..	321,900	288,800	33,100	11·5	—	—
Heifers in calf ..	425,300	352,800	72,500	20·5	—	—
Other Cattle :—						
Two years and above.. ..	935,900	971,200	—	—	35,300	3·6
One year and under two ..	1,130,300	1,117,100	13,200	1·2	—	—
Under one year	1,208,400	1,086,500	121,900	11·2	—	—
TOTAL OF CATTLE	6,064,300	5,849,800	214,500	3·7	—	—

With an increase of 214,500 in 1931 the total number of cattle has more than recovered the loss recorded in the two previous years. As regards the dairy herd, cows and heifers in milk show only a trifling addition of 9,100 or under 1 per cent. On the other hand, cows in calf increased in number by 33,100 or 11·5 per cent., and heifers in calf, which showed a relatively heavier reduction than other classes of cattle in 1930, were increased by 72,500 or 20·5 per cent. Among other cattle there was a decrease of 35,300 (3·6 per cent.) in cattle

two years old and above, and an increase of 13,200 (1·2 per cent.) in cattle one year and under two. The heaviest increase in other cattle was in those under one year, which were increased by 121,900, or 11·2 per cent.

The increase in the number of dairy cattle was general throughout the country, the highest percentage increase of 8 per cent. being recorded in the East Midland division. In the Eastern and South Eastern divisions the increase was about 6 per cent., while in the South Western division it was 2 per cent. As regards other cattle the increase in the number of those under one year old was shared by every county in England and Wales, while in the case of cattle one year old and under two there was considerable variation as between the different counties. The decrease in the number of cattle two years old and above was heaviest in the North Eastern division.

SHEEP

	1931	1930	Increase		Decrease	
	No.	*No.*	*No.*	*Per cent.*	*No.*	*Per cent.*
Ewes kept for breeding ..	7,255,700	6,810,700	445,000	6·5	—	—
Other Sheep :—						
One year and above ..	2,797,000	2,405,800	391,200	16·3	—	—
Under one year	7,692,700	7,099,300	593,400	8·4	—	—
TOTAL OF SHEEP	17,745,400	16,315,800	1,429,600	8·8	—	—

The increase shown in the number of sheep in 1930 was equivalent to 1·3 per cent., and was small compared with the substantial increase of 1,429,600 (8·8 per cent.) recorded this year. While all classes of sheep show considerable additions the heaviest relative increase is that of 391,200 (16·3 per cent.) in the number of other sheep one year old and above. Other sheep under one year show the largest actual numerical increase of 593,400 (8·4 per cent.) The number of breeding ewes has increased by 445,000 (6·5 per cent.).

All counties contributed to the increase in the number of sheep. In the case of breeding ewes the additions were relatively heaviest in the Eastern division with an increase of about 15 per cent., the East Midland division with an increase of about 13 per cent., and in the West Midland division where the addition amounted to 11 per cent. In the Northern division and in Wales, with the numerically

PIGS

	1931	1930	Increase		Decrease	
	No.	*No.*	*No.*	*Per cent.*	*No.*	*Per cent.*
Sows kept for breeding ..	401,600	315,700	85,900	27·2	—	—
Other Pigs ..	2,376,100	1,994,600	381,500	19·1	—	—
TOTAL OF PIGS ..	2,777,700	2,310,300	467,400	20·2	—	—

greatest sheep population, the increases in the total numbers of breeding ewes ranged from 3 to 5 per cent. Increases in the number of lambs were very much in accordance with the increases in the number of breeding ewes. The number of other sheep one year old and above were increased by 14 per cent. in the Northern division and by about 10 per cent. in the West Midland, South Western and North Western divisions, while in the remaining divisions increases in the total numbers of this class of sheep varied from 3 to 5 per cent.

The reduction shown in the two preceding years in the total number of pigs on agricultural holdings has been followed in 1931 by a substantial recovery, and at 2,777,700 the number is the highest on record with the exception of those returned in 1867, 1924 and 1928. As compared with last year the increase shown is 467,400 or 20·2 per cent., and while this increase is mainly due to an addition of 381,500 (19·1 per cent.) to the number of other pigs, the increase shown in the number of breeding sows is relatively much heavier. Breeding sows numbered 401,600 or 27·2 per cent. more than in 1930. The substantial increase in the number of breeding sows was shared by all counties, the additions being relatively greatest in the East and West Midland divisions and in the North Eastern and South Western divisions where increases of 30 per cent. or more were recorded in the total number of pigs of this class. The increase in other pigs was greatest in the Northern division, where the total number of this class was increased by about 27 per cent. In most other divisions the additions amounted to about 20 per cent. except in the Eastern division where an increase of only 9 per cent. was recorded.

HORSES

	1931	1930	Increase		Decrease	
	No.	*No.*	*No.*	*Per cent.*	*No.*	*Per cent.*
Horses used for Agricultural purposes (including Mares for breeding)..	666,500	682,800	—	—	16,300	2·4
Unbroken Horses (including Stallions):—						
One year and above ..	85,700	88,100	—	—	2,400	2·7
Under one year	37,800	37,900	—	—	100	0·3
Other Horses ..	148,400	152,500	—	—	4,100	2·7
TOTAL OF HORSES	938,400	961,300	—	—	22,900	2·4

The decline in the total number of horses on agricultural holdings has been continuous since 1921 although there has been a noticeable slackening in the rate of decrease. The numbers returned this year confirm this tendency. The total number of horses on June 4 was 938,400 or 22,900 (2·4 per cent.) less than in 1930, as compared with 961,300 and a decrease of 38,000 (3·8 per cent.) shown in the latter year. The number of horses used for agricultural purposes (including mares for breeding) shows a reduction of 16,300 (2·4 per cent.) as compared with a decrease of 24,000 (3·4 per cent.) in 1930. The

number of foals shows little change, while unbroken horses one year and above show a decline similar to that of last year, but in the case of other horses the decrease shown this year is 4,100 as compared with 11,500 in 1930.

AGRICULTURAL WORKERS

The total number of agricultural workers shows a further decline although the reduction this year is rather less than that recorded in 1930. The decrease in the total number is 25,200 (3·4 per cent.) as

AGRICULTURAL WORKERS

	1931	1930	Increase		Decrease	
	No.	*No.*	*No.*	*Per cent.*	*No.*	*Per cent.*
Regular Male Workers :—						
21 years old and over	434,800	445,700	—	—	10,900	2·4
Under 21 years old	116,900	118,800	—	—	1,900	1·6
TOTAL ..	551,700	564,500	—	—	12,800	2·3
Casual Male Workers :—						
21 years old and over	62,300	69,800	—	—	7,500	10·7
Under 21 years old	9,400	10,500	—	—	1,100	10·5
TOTAL ..	71,700	80,300	—	—	8,600	10·7
TOTAL MALE WORKERS, REGULAR & CASUAL	623,400	644,800	—	—	21,400	3·3
Women and Girls:						
Regular workers	64,400	65,300	—	—	900	1·4
Casual workers	28,700	31,600	—	—	2,900	9·2
TOTAL ..	93,100	96,900	—	—	3,800	3·9
TOTAL WORKERS, ALL CLASSES ..	716,500	741,700	—	—	25,200	3·4

compared with 28,500 (3·7 per cent.) in 1930. As was the case last year, the reduction was relatively least in regular male workers, although adult workers in this group show a greater falling off than the younger workers, whereas in 1930 the position was the reverse. As regards casual male workers adults show a smaller reduction than in 1930, while younger workers of this class show a rather greater decline. Both regular and casual female workers show less reduction than in 1930, although the position in these two classes is rather better as regards regular workers than casual workers.

HOPS

Acreage of Hops.—Preliminary statement compiled from the returns collected on June 4, 1931, showing the acreage under Hops in each County of England in which Hops were grown, with a comparative statement for the years 1930 and 1929.

Counties, &c.		1931	1930	1929
		Acres	Acres	Acres
Kent ..	East..	2,560	2,685	3,311
	Mid.	3,550	3,606	4,900
	Weald	5,440	5,529	6,661
	Total, Kent ..	11,550	11,820	14,872
Hants		750	867	1,012
Hereford		3,810	3,688	3,855
Surrey		150	140	161
Sussex		1,450	1,680	2,139
Worcester		1,830	1,732	1,818
Other Counties		60	70	129
TOTAL		19,600	19,997*	23,986*

* These figures include the acreage left unpicked which was estimated in 1930 to be about 3,500 acres and in 1929 about 200 acres.

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NOTES ON PRICES AND SUPPLIES

R. J. THOMPSON, C.B., O.B.E.

THIS year's Agricultural Returns show that the effort to reduce expenses in farming is being largely concentrated on the cutting down of the area under corn crops, of which 305,000 acres fewer than last year have been sown. Since the slump in prices began in the autumn of 1929, the corn area has been reduced by 448,000 acres, while the grass area, including under this head permanent pasture, clover and rotation grasses and rough grazings, has been increased by almost exactly the same amount. Further, the area devoted to crops other than corn and grass is about 130,000 acres less than in 1929, so that the total reduction in the crops requiring most labour is 578,000 acres. Most of this shift in the crop area has taken place in the past year, and although it is only a continuation of a process that has been going on for many years the rate of change is high. A compensating feature is to be found in the increases in cattle, sheep and pigs, which show that the country is now more heavily stocked than for

some years past. As live stock and dairying account for 70 per cent. of the total agricultural production, it is satisfactory that there is no set-back here, at any rate so far as numbers are concerned.

Turning to current prices, there is no material change to be recorded, though unfortunately the trend is frequently downwards. Second early potatoes are realizing fair prices. Except for milling offals, feeding stuffs generally are slightly cheaper, and the July index number is 13·8 per cent. below that of July, 1930, and nearly 44 per cent. below the figure for the same month in 1929. Argentine maize is obtainable for about one-half last year's price.

Some comparative prices ruling a month ago and a year ago are shown in the table below.

	Prices in the middle of					
	August, 1931		*July,* 1931		*August,* 1930	
	s.	d.	s.	d.	s.	d.
Wheat, *Gazette* average, per cwt. ..	6	6	6	4	8	4
Fat cattle, 1st quality, per cwt. ..	49	2	51	0	52	8
Beef, English N.M. Prime, per lb. ..		8¼	0	8¾	0	9¼
Beef, Argentine chilled H.Q., per lb. ..	0	7¾	0	6½	0	9⅛
Fat sheep, 1st quality, per lb.	0	11½	0	11½	1	1¾
Mutton, English, per lb...	0	10¼	1	0	1	0
Lamb, New Zealand, per lb.	0	8	0	8	0	9⅜
Bacon pigs, 1st quality, per score ..	10	10	11	3	15	6
Bacon, Irish green, per cwt.	85	0	85	0	108	0
Bacon, Danish green, per cwt.	80	0	70	0	98	0
Pork pigs, 1st quality, per score ..	12	1	12	5	17	2
Pork, English, per lb.	0	7¾	0	7½	0	11
Cheese, Canadian, new, per cwt. ..	65	0		—	86	0
Cheese, New Zealand, per cwt... ..	65	0	64	6	84	0
Eggs, N.M. Standard, per 120	15	0	14	9	18	3
Potatoes, British Queen, per ton ..	130	0		—	120	0
Maize, Argentine, per cwt.	3	8	4	1	7	6

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ended August 12, 1931, and in corresponding weeks a month and a year earlier. For fat stock and wheat, the prices are general averages for the country, but in other cases they are those recorded for first quality at London markets.

Wheat.—Current world wheat prices continue to decline owing to free offers from all quarters and the lack of European demand. The Liverpool October future, which in the middle of July stood at 4*s.* 1⅜*d.* per 100 lb., was down to 3*s.* 11*d.* by the middle of August—a figure that was little more than one-half that ruling at the same date last year. Thus the beginning of the new cereal year sees prices at an abnormally low level and—with new crops pressing on the market—it is uncertain whether the bottom has yet been reached. The current harvest

in the chief buying countries of Europe, though not yet assured, will probably prove better than last year, while the unfavourable financial situation is likely to cause the quota system on the Continent to be used energetically to restrict the importation of foreign grain. Low prices may induce merchants to increase their stocks, but it is doubtful if the total European purchases for some time to come will equal those of 1930-31. Competing to meet this limited demand are the crops and surplus stocks of Argentina, the United States, Canada and Russia, which together are probably nearly as great as they were at this time last year. There is little indication of better prices at the moment, although the unfavourable harvest weather is a strengthening factor.

In due course, however, selling pressure should become somewhat lighter. The coming harvests in Australia and Argentina are almost certain to be below the level of 1930, so that after the turn of the year less grain will be on offer from these sources. The poor Canadian harvest and the small crop of spring wheat in the United States should also have some effect. It cannot be expected that the over-supply of wheat can be absorbed during the current season, but the surpluses that have been burdening the market will begin to be reduced in 1932, and a very slight improvement in the selling position would quickly stimulate demand, provided financial conditions are not too unfavourable. There seems thus to be a probability that prices will improve as the cereal year advances. Those growers of wheat in England who can afford to hold their grain over to next year should find it to their advantage to do so.

The preliminary forecast issued in August puts the production of England and Wales at 4,713,000 qr., as compared with 4,913,000 qr. last year, which was itself one of the lowest on record. Imports of wheat into Great Britain have recently been large and port stocks show a substantial increase, holdings at the beginning of August being 5 million cwt. or 2 million cwt. more than in July.

Cattle.—The somewhat lower prices that have been obtainable for liquid milk, particularly for the portion sold as "manufacturing milk," have had no effect on the country's dairy herd, as the total number of cows shown in the Agricultural Returns increased to 2,790,000, a figure that has not been reached since 1927. The number of cows and heifers in milk showed little alteration, but the number of cows and heifers

in calf rose by 106,000, or over 16 per cent. The number of heifers in calf was particularly high at 425,000, no previous similar figure having been recorded. The increase in calf-rearing that has been noticeable for some time past shows in the much larger number of cattle "under one year," the figures having risen to 1,208,000 or 122,000 more than last year, and the highest since 1926.

On the other hand, there is no expansion in the number of older cattle, which indeed show a slight drop of 22,000 and are lower than for several years past. Apart from cows and calves, therefore, the number of animals available for slaughter in the present season is likely to be somewhat less than in the past twelve months. Prices of fat stock are falling, and in the middle of August were about 49*s*. 2*d*. per live cwt. as against 51*s*. last month and 52*s*. 8*d*. in August, 1930. A further decline is probable as supplies of grass-fed cattle come on the market. Chilled beef from the River Plate continues in moderate supply and prices show some improvement.

Sheep.—The satisfactory prices obtainable in 1928, 1929 and 1930 for fat sheep are reflected in the substantial increase in numbers recorded in this year's returns, which are higher than in any year since the War. Breeding ewes, which have been fluctuating within comparatively narrow limits since 1926, show a definitely upward movement from 6,810,000 in 1930 to 7,256,000. In proportion to the breeding ewes, the number of lambs is higher than in recent years, a result that may be due to a more favourable lambing season or may indicate that fewer lambs had been sold off before the returns were collected in June. There is support for the latter view in the fact that the number of sheep and lambs offered at representative markets up to that date was only 798,000 as compared with 915,000 in 1930 and 871,000 on the average of 1927-29. In any case the high numbers both of lambs and of sheep over one year indicate that supplies in the current season are likely to be large.

Prices for first quality Downs and Cross-Breds were fairly steady for five weeks between the middle of July and the middle of August at about 11½*d*. per lb., but lambs weakened from 14½*d*. to 13½*d*. Imports of lambs from Ireland have been noticeably light this year, the total to the end of July being only 213,000 as compared with 267,000 in 1930. The killing season in New Zealand has now closed, and the quantity remaining to be shipped at the end of July was less than last

year, so that imports up to the opening of the new season in November or December should be moderate.

Pigs.—The number of pigs recorded annually in June has for many years shown a cycle of more or less regular fluctuations, periods of increasing numbers alternating with periods of decline. Thus, as can be seen from the following table, there was a rise from 1922 to 1924, and a decline from 1924 to 1926; this was followed by a similar rise and fall between 1926 and 1930, while the returns for 1931 show that the numbers have again risen.

(*In thousands*)

	Sows	*Total pigs*		*Sows*	*Total pigs*
1921 ..	336	2,505	1927 ..	393	2,692
1922 ..	302	2,299	1928 ..	380	2,971
1923 ..	389	2,612	1929 ..	307	2,366
1924 ..	449	3,228	1930 ..	316	2,310
1925 ..	316	2,644	1931 ..	402	2,778
1926 ..	301	2,200			

This ebb and flow may be explained in a general way by saying that when the number of pigs is high, the increased supply results in a lower price and production becomes less profitable; sows are then killed off, the output is reduced, and prices begin to recover; breeding is then again stimulated until production reaches a level at which prices begin to fall. To put it another way, when pig-feeding appears likely to be profitable there is a demand for store pigs that leads to an increase in the number of sows and in the number of pigs available. This in time drives down prices, store pigs become very cheap and sows are slaughtered. In either event, however, the swing of the pendulum appears to go too far; when store pigs are high in price the number of sows is increased beyond the requirements of the market, while when the slump comes the reduction in numbers is again excessive. A vicious circle is created that is apparently resistant to any permanent increase in pig-keeping.

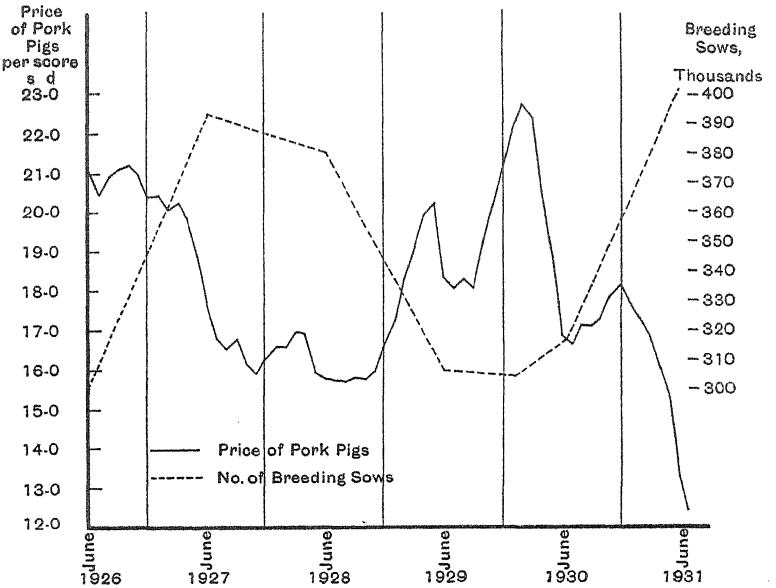
This may be illustrated by the changes in the past five years. In 1926, prices for porkers were at a high level, averaging for first quality about 21*s.* 3*d.* per score dead weight; the embargo on pork was imposed in that year and conditions for pig-breeding appeared favourable. This resulted in a strong demand for store pigs, weaners in September realizing as much as 50*s.* 2*d.* per head. The number of sows was increased between June, 1926, and June, 1927, from 301,000 to 393,000, and remained high until June, 1928, when the numbers returned

showed a slight decline to 380,000. In the meantime, however, porkers had fallen in price almost continuously from the beginning of 1927 to June, 1928 (from 20*s*. 5*d*. to 15*s*. 4*d*. per score), while weaners had dropped uninterruptedly from the high figure mentioned above to 23*s*. 2*d*. in June, 1928.

The small drop in the number of sows returned in June, 1928, shows that a beginning had already been made towards decreasing the supply: this was continued to June, 1929, and according to the winter census to January, 1930, when the numbers had fallen to 304,000 or almost the same figure as in 1926. Whilst this attempt at adjustment was being made, however, the price of pigs began to recover as from the end of 1928; during 1929, prices were fairly good, the average for first quality porkers being 18*s*. 11*d*. per score, and in the first three months of 1930 they averaged 22*s*. 6*d*. per score. Weaners also improved, and by the end of 1929 had reached 40*s*. 4*d*. per head, and rose still further in the early part of 1930. Nevertheless, the number of sows continued low until June, 1930, although they were evidently once again on the up-grade, as there was a small increase to 316,000. This upward movement continued through the following year and the number of sows returned in June, 1931, was 402,000, although prices have been moving downwards since March, 1930.

The explanation of this "lag" in the adjustment of supply to demand presumably is that when the number of sows has once been increased, some time elapses before they become sufficiently unprofitable to justify slaughtering, while when there is a strong demand for store pigs and prices are high, it again takes time for sows to be produced. These changes can be seen in the diagram opposite, which shows for the last five years the movement in fat pig prices (first quality porkers per stone dead weight) and the fluctuations in the number of sows. The prices of store pigs follow the general movement in porkers.

In the case of pork-pigs, the influence of large supplies on price is easily understood, as the market for pork is relatively limited and rapidly liable to over-supply; but in the case of bacon-pigs, the demand for home-cured bacon should theoretically provide a wide outlet for pigs not required for the pork market, and thus tend to relieve the pressure of supplies and the consequent depression in prices. This is not, however, the fact: bacon-pigs appear to be subject to practically the same influences as pork-pigs, the general trend of prices being similar, though from time to time, when imported bacon is cheap, they tend to fall rather further. It seems, therefore, that the demand



for home-produced bacon is limited like the demand for pork, and that when pigs are over-plentiful, the bacon-curer is only prepared to buy them at a reduced price. The explanation of this is probably to be found in the fluctuations in supply, as these in themselves prevent the bacon-curing industry from developing beyond a certain point. If, as is no doubt true, the total annual consumption of pork is fairly uniform, it is obvious that the surplus of pigs available for bacon must be very variable from year to year, and that the bacon-curer cannot possibly obtain the steady and increasing supply that would be essential for an extension in the total output. In a year of large supplies, he is hindered from attempting a permanent increase in his business by the knowledge that in a year or so offerings will be insufficient: a temporary extension is all that is possible.

Looking at the present position in the light of past experience, and assuming that future trends follow the general lines of previous years, it seems likely that the stock of sows in the country, though declining, will continue high till June next. This will provide a large supply of pigs in the current twelve months, and prices are likely to remain low. The result of these low prices will no doubt be that the stock of sows will be sharply reduced after June next; prices will then gradually begin to move upwards.

This regular swing upwards and downwards, which has been experienced in the past and is likely to happen again, can hardly be of benefit to the industry; some breeders and feeders manage to secure large profits when conditions are favourable, but the bulk of the over-production coincides with lower prices, while when higher prices are obtainable the sales are necessarily fewer. An adjustment of supply to demand resulting in more stable prices would, one would suppose, be to the general advantage. For instance, if the stock of breeding sows could be restricted to 340,000 or thereabouts, the wide fluctuations in price that arise from the over-supply provided by the produce of 400,000 sows and from the under-supply resulting from 300,000 sows would presumably be avoided. There would then be less inducement to attempt to snatch a temporary profit from the gamble of the store market, and given more stability in price and supply, the development of the home bacon industry would become a possibility.

As regards current prices, first quality porkers in the middle of August were only averaging 12*s.* 1*d.* and baconers 10*s.* 10*d.* per score dead weight, by far the lowest rates recorded since the War. In comparing the present with the past, however, the very great difference in the values of feeding stuffs needs to be borne in mind: proportionately, pork-pigs are quite possibly in no worse position now than they were in 1927 and 1928.

Another factor that must be taken into account at this season of the year is the decline due to a lessened demand for pork in the summer. In some years, particularly when the supply is on the low side, the decline is not very marked, while in others it merges into the general downward tendency. In view of the present low prices for pork, *i.e.*, 7½*d.* to 8*d.* per lb., there ought to be some recovery in pig prices when the demand for pork improves, though the large number of pigs available is bound to have a depressing influence. The imports of bacon in July were again very high, 944,000 cwt. being received as against 763,000 cwt. in July, 1930. Demand, however, has been good and prices have risen, Danish bacon in the middle of August being quoted at 80*s.* per cwt. as against a minimum of 58*s.* two months earlier. The preliminary report on the pig census in Denmark taken on July 15, 1931, shows a total of 5,473,000 pigs, an increase of 601,000 (or 12 per cent.) as compared with last year; this figure is more than double that recorded in 1925, since which year pigs in Denmark have increased practically continuously. In January

last, the number of breeding sows showed a very slight reduction, and it was thought that this might indicate that pig production in Denmark had reached its peak. This is not so, however, as the July returns show an increase of 57,000 breeding sows since January last and 51,000 since July, 1930.

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SEPTEMBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

THIS month is an important one in the farming calendar. In the north harvest is in full swing; in the south the cereal harvest should be concluded and active preparations made for another, even to the extent of sowing seed.

On the business side, the end of the month is very generally the completion of the financial year, when accounts are made up and hopes and fears give way to exact knowledge.

The Michaelmas term will mean for some the completion of their tenancy of a farm, possibly the end of their farming career; for others it may be only a change from one farm to another, and for some it may be a commencement. Sales of live and dead farming stock are common events. A complete dispersal of herds, flocks and studs presents opportunities for farmers to obtain fresh blood and lay foundations that are not normally possible when the female stock ordinarily available is of a surplus cast-off character.

Sales of implements are no less important in providing opportunities for the smaller farmers to secure partly worn implements, such as binders, that will serve them well for many years, and that cost them a figure more in keeping with the area at their disposal. In the same way, waggons and carts are obtained by farmers who have insufficient capital to enable them to purchase the new articles, or who have such a limited use for them that the higher capital expenditure is not justified.

Arable Land.—There is no distinct interval between one harvest and the cultivation of the land for the next. The best farmers make the fullest preparation in good time. A wet summer and a late harvest are big handicaps, and in such circumstances organization and energy are essential if success is to be obtained. In the south 1931 has been a poor season for bare fallowing; the area under bare fallow is greater than usual, and at the time of writing (mid-August) very many

bare fallows are far from fit for the growth of a cereal crop. It is true that cereals are low in price, but it is false economy to sow cereals on land that is not fit. The result may be a crop failure and a consequent increased growth of weeds. The value of clean land in producing good crops cannot be exaggerated, and likewise good crops tend decidedly to keep land clean. There are good economic reasons at present for reducing the area of arable land, but there are no reasons that justify a lower standard of farming on the arable land that remains. On the contrary, the land that still remains under the plough should have been selected because it is most suitable for the purpose, and it should be done well. Judicious manuring and good cultivations do pay, even if it is only by reducing losses.

Catch Crops.—Now is the time to sow catch crops; these are closely associated with intensive sheep farming practice, and are particularly valuable for flocks intended to produce early fat lambs or ram lambs for breeding purposes. For complete success the land should not be too heavy or wet, the district should be fairly mild, and the land should be in good manurial condition. On poor land catch crops are seldom satisfactory, especially if sown late. The time of sowing depends on the type of crop and the purpose for which it is grown. Most of the crops used come into fit condition in late spring, but unfortunately are at their best for rather a short period. It is therefore necessary to provide a succession of crops both by varying the time of sowing and by sowing a variety of crops. The crop that can be sown with the least amount of preparation is trifolium or crimson clover. This crop is less useful as a folding crop than as a soiling crop where it can be cut and carted to cattle and horses. As soon as it attains a fair bulk it should be used, as it flowers early and soon deteriorates. For this reason it is a mistake to sow too large an area, and it is a good plan to use partly early strains and partly late strains. Seeding should be done on a cereal stubble as soon as possible after harvest; the land should not be ploughed but merely well harrowed, and subsequently well rolled down after the seed has been sown. The main portion of the catch crops consists of either tares or vetches alone or in mixture with hardy cereals like rye, winter barley or winter oats. The crop that will produce the earliest feed in spring is early-sown rye, but a mixture of rye and vetches gives more bulk and is more nutritious. Next in earliness is winter barley and later still winter oats; each of these can

be sown in mixture with vetches and this is an advantage. Vetches are also sown alone, and if small areas are sown in succession, some variation in the time they are fit for use will be ensured. A thick seeding of vetches can be recommended for land that is in need of cleaning, and if the crop succeeds it will materially weaken the weeds, so that they may be dealt with more easily when the vetches have been removed. All such crops are essentially catch or stolen crops, and their common position is between an early-harvested grain crop and a root or fallow crop. In some districts it is possible to follow an early crop of rye or rye and vetches with a crop of mangolds. If this is taken in hand immediately the rye is removed the cultivations are few and it is easy to obtain a good seed bed by a single ploughing and a few turns of the harrow and roller. In such circumstances mangolds grow quickly, and there is usually a noticeable scarcity of annual weeds until the mangolds have got a good start. The great bulk of the catch crops, however, is not fed off early enough to permit of mangold sowing, so that such crops are followed by swedes, turnips or kale. Success of the system of catch cropping is very dependent on prompt action after harvest, and again after the catch crop has been removed in preparing the land and sowing the succeeding crop. Delay often means failure.

Beans.—Another crop that can be sown now is beans. Winter-sown beans have an advantage over those sown in spring by the fact that they ripen earlier and are less liable to attacks of Black Fly. In recent years the area under beans has been reduced in greater proportion than the area of arable land. This may be because a higher proportion of typically good bean land has been converted to pasture, or to the greater variety of nitrogenous foods now available at prices that are at the moment less than the cost of growing beans, or to the prevalence of diseases and pests. The crop is somewhat uncertain, and it is an old saying that a farmer seldom grows beans without regrets : if the crop is good he regrets that he did not grow a greater area, and if it is poor he regrets having grown any. Beans respond well to farmyard manure, and a supply of potash is most important and greatly reduces the liability to diseases such as chocolate spot. The tilth need not be so fine as for cereals and a rough surface greatly facilitates horse hoeing in spring.

Cereals.—Wheat is not usually sown this month, but on heavy soils and especially after a bare fallow early sowing

is important. Wheat likes a firm and stale seed-bed, and no time should be lost in getting ready. Land on which beans or peas have been grown often requires some cultivation for cleaning purposes; this loosens the soil, and on light land many failures or partial failures of wheat after peas are due to too loose a seed-bed, this bringing about loss of plant during the winter. Winter-hardy barley and oats can be sown towards the end of the month.

During the 1931 season, the storms in July did much damage to winter oats and made harvest difficult. In spite of these difficulties there is no reason to reduce the area; compared with spring-sown oats the yields of winter oats are good, and they fit in well with the farming programme because of their earlier ripening, thus ensuring a better distribution of the labour at harvest and incidentally providing opportunities for the early sowing of catch crops.

Live Stock.—Nights are now longer, and heavy dews and more moisture in the ground begin to have their effect on young stock. Many calves get a severe set back by being left out at night too late in autumn. There is danger of an attack of husk or hoose, especially after a wet season, but apart from this trouble it is good practice to bring young calves into a yard and give them dry food. If a yard is not available some concentrated food should be given. It appears to be an advantage to give this food about nine o'clock in the morning, as feeding at this hour encourages the cattle to wait for it rather than start grazing in the early morning. Older cattle will continue to thrive as long as grass is plentiful; cattle that are to be wintered outside in store condition need not have any supplementary food for some time yet. On dry, fairly sheltered land, outwintering of heifers to be used for breeding purposes might be more widely practised. There is a saving of labour and litter and less liability to contract disease. The animals must, however, be well fed, and in spite of the grass that may be available their requirements are not much different from yard- or stall-fed stock of this kind from December to April. Too often supplementary foods are not given early enough, and a supply of roots and hay during winter is an economic necessity. Grain or cake need not be given, and certainly not in large amount. The animals should be kept growing and fit, and if wintered without cake or corn will be in a position to make good use of the early spring grass, and by midsummer may be equal to or even better than stock that have been more liberally fed with concentrates during winter.

PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended August 5				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	..	..	..	..	..
Nitro-chalk (N. 15½%) ..	*	6 0*d*	6 0*d*	6 0*d*	6 0*d*	7 9
Sulphate of ammonia :—	*					
Neutral (N. 20·6%).. ..	*	6 0*d*	6 0*d*	6 0*d*	6 0*d*	5 10
Calcium cyanamide (N. 20·6%)	*	6 5*e*	6 5*e*	6 5*e*	6 5*e*	6 1
Kainit (Pot. 14%)	§	..	..	2 11	2 16*g*	4 0
Potash salts (Pot. 30%) ..	§	..	..	4 5	4 6*g*	2 11
,, (Pot. 20%) ..	§	..	..	2 19	3 4*g*	3 2
Muriate of potash (Pot. 50%)..	§	..	..	8 1	8 8*g*	3 4
Sulphate ,, (Pot. 48%)..	§	..	..	9 19	10 4*g*	4 3
Basic slag (P.A. 15¾%)‖ ..	§	2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..	§	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	§	3 11	..	3 9	3 1	3 10
,, (S.P.A.13¾%)	§	3 5	2 15	3 3	2 15	4 0
Bone meal (N.3¾%, P.A.20½%)	§	8 15	7 10	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	5 5*f*	6 0	4 15	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra and for lots of 2 tons and under 4 tons 5*s.* per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails 2*s.* 6*d.* extra.

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NOTES ON FEEDING

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Flushing of Ewes.—The number of twin lambs produced, or at least the number of double conceptions that occur, depends partly on the inherent fecundity of the dams, and partly on their treatment before and during the time that they are running with the ram. It is recognized that the smallest percentage of lambs is obtained when ewes are then poor, in a weak state of health, going back in condition, or very fat. Investigations have shown that the highest birth rate is secured when the ewes are in moderately good but improving condition at the time of tupping. This condition can be secured best if the ewes have been fairly lean at weaning time, are brought forward very gradually on moderate keep to within about a fortnight of tupping, and are then provided with more nutritious food, or, in other words, with better keep.

"Heat" in animals appears to be brought about through the action of an internal secretion elaborated by the ovaries, the organs that give rise to the female germ cells or ova. A change to better food exercises a stimulating effect upon the secreting activity of the ovaries, causing the ovarian vesicles that contain the ova to reach maturity more rapidly and to discharge a larger number of ova during the early "heat" period.

It is widely recognized that a greater proportion of twins is generally produced in the earlier part of the breeding season, the explanation being that multiple ovulations or the production of two or more ova at any one time of "heat" tend to occur most commonly at the beginning of the tupping period. Accordingly, postponement of tupping, after the ewes are ready to take the ram, results in a lower proportion of twins. Multiple ovulations are encouraged by changing the ewes on to a higher plane of nutrition—the practice to which the term "flushing" is applied.

In the current season the difficulty on lowland grass farms has been to prevent ewes becoming too fat since their lambs were weaned. Grass has been very abundant and consequently it has not been easy to maintain ewes in the right sort of condition. This has been especially true with Half-Bred and other types of thrifty grassland ewes, more particularly those whose lambs were sold as early fat lamb. All that the careful flockmaster can do is to confine them to the poorer pastures on the

farm up to within a fortnight of putting them to the ram. Unstocked aftermath or fresh young grass is regarded as best suited for flushing on a grassland farm. Where aftermath is not available, it is a sound practice to mow the top off a pasture with the mowing machine some time before it is required for the mating flock, and preferably not to stock it with other sheep before it is required for this purpose. By this means it is possible to get for the ewes' consumption a growth of fresh young succulent grass specially nutritious and palatable, and presumably relatively rich in protein.

Marshall has recorded* the effect of flushing in Scottish flocks, mostly on arable farms. He found that Half-Bred (Border Leicester-Cheviot) ewes that were kept on poor grass during the summer and simply put on superior pasture, usually the best available on the farms concerned, for a short time previous to and during tupping, gave lambing returns of upwards of 150 and 170 per 100 ewes. With similarly bred ewes, in three instances the lambing percentages were over 190, the exact figures being 191·5, 193·7, and 196. In these three instances the ewes were also kept on grass during the summer. In the first, the ewes were "flushed" as follows. For three weeks during tupping they were given a full supply of Scotch turnips; later, during pregnancy, they received dried grains as well as turnips. In the second lot, the ewes were given, at tupping time, a mixture consisting of linseed cake, undecorticated cotton cake, and crushed barley as well as turnips or cabbages. Some turnips were allowed throughout pregnancy. In the third lot, that in which the percentage was as high as 196, the ewes at tupping time were put on better pasture, and, from the time they went to the ram, until lambing time, were given a limited quantity of turnips and as much good hay as they cared to eat. These instances, typical of Scottish pre-war arable land farms, suffice to show that flushing may be satisfactorily practised in a variety of ways.

On poor land farms it may be necessary to provide ewes at mating time with something more in the way of food than the best pasture that a poor farm may afford. When good hay is plentiful and very cheap an attempt might be made to stimulate ewes with an allowance of attractive good quality hay.

Where concentrated food is considered necessary for flushing, experience has shown that a mixture, of which the greater proportion consists of protein-rich foods, may be most satisfactory; for example, one made up of equal parts by weight of

* "Fertility in Scottish Sheep." *Highland and Agric. Soc., Trans.* 1908.

decorticated ground nut cake, undecorticated cotton cake and crushed oats or flaked maize, or one consisting of three parts crushed peas or beans and two parts good quality crushed oats. Another alternative is a mixture of three parts crushed beans, one part crushed oats, and one part bran or dried grains. If the flock consists of grassland ewes that are notoriously shy trough feeders, it is important that the mixture should be specially palatable and attractive.

Rams will require and repay attention during the tupping season. Unfortunately it is a fairly common fashion to prepare shearling rams and ram lambs for sale by confining them in a fold and feeding heavily on concentrated foods. Not infrequently these concentrates are not wisely chosen, and may affect the ram's potency. For service, a ram should be thoroughly fit and active, not overfat and sluggish. On the other hand, if he is poor and badly nourished he may be weak and ineffective. Exercise and suitable feeding are the important essentials in getting and keeping a ram fit. A ram lamb that is having a heavy season may require some concentrated feeding while he is with the ewes. In such an event, if the ewes themselves are not being trough-fed, the extra time, trouble and cost involved should be much more than repaid if the shepherd feeds the ram daily with a moderate allowance of the same kind of concentrated mixture as that recommended above for flushing ewes.

Some Points in Poultry Feeding.—It is now recognized in regard to various classes of farm stock that a disturbance of the disposition of calcium phosphate in the body gives rise to the condition known as rickets. In poultry this condition or disease occurs both in young growing chicks and in adult stock, such as hens in heavy lay. In the chicken, when calcium phosphate is not being sufficiently deposited in the growing bones, deformities of the limbs may result. In the laying bird the bones may be robbed of their calcium phosphate to an excessive extent to provide material for shell-making in the stress of very heavy egg production. Results in the latter case are leg weakness and the laying of thin shelled eggs

It is now generally accepted that the cause of rickets may arise from the provision of insufficient mineral matter, or from the absence of vitamin D. This vitamin plays an essential part in the assimilation of calcium and phosphorus by the bird. The vitamin itself may be developed in the body by exposing the bird to natural or artificial sun rays. It is of

special importance, however, to appreciate that vitamin D is apparently abundantly present in cod liver oil.

Results of experiments have shown that the rachitic condition in animals can be prevented or cured either by the provision of sun rays or by feeding cod liver oil in conjunction with an adequate supply of mineral matter. One of these experiments was carried out on a commercial poultry farm in Northamptonshire in the rearing seasons of 1929 and 1930. In the first season the object was to ascertain the effect of ultra-violet light on the growth of young chicks reared intensively for the first few weeks of their lives. The rays were provided by means of a carbon arc lamp. Chicks were kept in two separate lots in two compartments of the same brooder house, and under otherwise identical conditions, except that certain batches of chickens were subjected to ultra-violet light irradiation, while the others were not. Both lots were fed in the same way and on the same mash, which contained 1 per cent. of cod liver oil. The experiment was continued for some seven months with different lots of chicks, so that about 2,000 chicks passed through one or other of the two compartments during the period of the experiment. Observation of the chicks, together with the weighing of representative batches, showed no practical advantage from the ultra-violet light when provided in addition to cod liver oil in the chickens' mash.

In the second season certain batches of chickens received cod liver oil, other batches received cod liver oil plus artificial sun rays, and others artificial sun rays only. It was found that those that were given cod liver oil did just a little better than those subjected to ultra-violet light treatment, while both of these lots did considerably better than the lot which was given cod liver oil together with sun rays.

From this and other experiments, one gathers that for practical purposes cod liver oil may be fed or ultra-violet light provided with equally good results as regards the prevention of rickets or of malnutrition arising from inadequate assimilation of calcium and phosphorus. In practice, however, it is of importance because cod liver oil included at the rate of 1—2 per cent. of the chicken mash is the cheaper and more convenient method. The adoption of this system of feeding chicks is apparently necessary in the absence of a sufficient supply of the natural rays of the sun, as would be the case in the early hatching months of the year, in a backward and sunless spring and summer, or at all seasons of the year with chicks kept

intensively. Similarly, it appears that the need for the inclusion of 1 to 2 per cent. of cod liver oil in the mash of laying hens in sun-deficient periods may be almost equally important.

Autumn Feeding of Laying Birds.—In the early autumn there is a likelihood that hens may become too fat unless they are carefully watched and the feeding is properly adjusted according to their needs. On the other hand, pullets that have just started to lay may rapidly lose condition and go into a false moult unless they are sufficiently well fed.

In order to ascertain exactly what the condition of the birds may be, advantage should be taken of the opportunity of handling them when removing them from the trap-nest. Where trapnesting is not practised the birds can be handled with least trouble after they have gone to roost at night.

For the sake of convenience the same mash mixture may be employed for both hens and pullets, but the grain mixture should be adjusted to suit the different requirements of hens that are tending to become overfat, and pullets that are inclined to become too thin. The kind of mash mixture employed for autumn feeding on this Institute farm is as follows (all parts by weight) :—

1 Fish Meal.
2 Bran.
3 Sharps.
2 Sussex Ground Oats.
2 Maize Meal.
plus 1 lb. of salt per 100 lb. of this mixture.

The corn mixture for hens :—
1 Oats.
2 Wheat.
2 Kibbled Maize.

The corn mixture for pullets :—
1 Wheat.
2 Kibbled Maize.

Birds should be kept short of food in the morning, but in the evening their crops should be full when they go to roost. If on dry mash feeding there is any under-consumption of food that might react unfavourably on the condition of the pullets, it is advisable, for a short period, to give one feed of wet mash daily. The total amount of food given per day must be strictly controlled according to the appetite and condition of the birds.

* * * * * *

Description	Price per qr.		Price per ton	Manurial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 13	0 11	6 2	72	1 8	0·89	9·6
Barley, British feeding	—	—	5 15	0 9	5 6	71	1 6	0·80	6·2
„ Canadian No. 3 Western	19 3	400	5 8	0 9	4 19	71	1 5	0·76	6·2
„ Persian	17 3	„	4 17*	0 9	4 8	71	1 3	0·67	6·2
„ Russian	18 0	„	5 0*	0 9	4 11	71	1 3	0·67	6·2
Oats, English, white	—	—	7 0	0 10	6 10	60	2 2	1·16	7·6
„ „ black and grey	—	—	6 5	0 10	5 15	60	1 11	1·03	7·6
„ Canadian No. 2 Western	18 9	320	6 12	0 10	6 2	60	2 0	1·07	7·6
„ „ No. 3 „	17 9	„	6 5	0 10	5 15	60	1 11	1·03	7·6
„ „ Mixed Feed	11 6	„	4 0*	0 10	3 10	60	1 2	0·62	7·6
„ Argentine	12 0	„	4 3	0 10	3 13	60	1 3	0·67	7·6
„ Chilian tawny	13 6	„	4 15	0 10	4 5	60	1 5	0·76	7·6
„ „ white	21 9	„	7 12	0 10	7 2	60	2 4	1·25	7·6
„ Russian	19 6	„	6 17*	0 10	6 7	60	2 1	1·12	7·6
Maize, Argentine	17 0	480	4 0	0 9	3 11	81	0 11	0·49	6·8
„ South African	22 6	„	5 5†	0 9	4 16	81	1 2	0·62	6·8
Peas, Indian	—	—	7 10†	1 0	6 10	69	1 11	1·03	18
„ Japanese	—	—	17 5†	1 0	16 5	69	4 9	2·54	18
Dari	—	—	9 0	0 11	8 9	74	2 3	1·20	7·2
Milling offals—									
Bran, British	—	—	4 15	1 0	3 15	42	1 9	0·94	10
„ broad	—	—	5 7	1 0	4 7	42	2 1	1·12	10
Middlings, fine, imported	—	—	5 15	0 16	4 19	69	1 5	0·76	12
„ coarse, British	—	—	5 15	0 16	4 19	58	1 8	0·89	11
Pollards, imported	—	—	4 15	1 0	3 15	60	1 3	0·67	11
Meal, barley	—	—	6 10	0 9	6 1	71	1 8	0·89	6·2
„ maize	—	—	5 5	0 9	4 16	81	1 2	0·62	6·8
„ „ germ	—	—	5 2	0 14	4 8	85	1 0	0·54	10
„ locust bean	—	—	5 5	0 7	4 18	71	1 5	0·76	3·6
„ bean	—	—	8 2	1 3	6 19	66	2 1	1·12	20
„ fish	—	—	17 0	3 1	13 19	53	5 3	2·81	48
Maize, cooked flaked	—	—	6 5	0 9	5 16	83	1 5	0·76	8·6
„ gluten feed	—	—	5 7	0 19	4 8	76	1 2	0·62	19
Linseed cake, English, 12% oil	—	—	8 7	1 8	6 19	74	1 11	1·03	25
„ „ „ 9% „	—	—	8 0	1 8	6 12	74	1 9	0·94	25
„ „ „ 8% „	—	—	7 15	1 8	6 7	74	1 9	0·94	25
Soya bean cake, 5½% oil	—	—	7 12*	1 19	5 13	69	1 8	0·89	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	4 12	1 6	3 6	42	1 7	0·85	17
„ „ Egyptian, 4½% „	—	—	4 5	1 6	2 19	42	1 5	0·76	17
Ground-nut cake, 6-7% oil	—	—	6 0*	1 6	4 14	57	1 8	0·89	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 5	1 19	5 6	73	1 5	0·76	41
Palm kernel cake, 4½-5½% oil	—	—	6 0§	0 16	5 4	75	1 5	0·76	17
„ „ „ meal 4½% „	—	—	6 10§	0 16	5 14	75	1 6	0·80	17
Palm kernel meal, 1-2% „	—	—	5 5	0 17	4 8	71	1 3	0·67	17
Feeding treacle	—	—	5 0	0 9	4 11	51	1 9	0·94	2·7
Brewers' grains, dried ale	—	—	4 5	0 17	3 8	48	1 5	0·76	13
„ „ „ porter	—	—	3 15	0 17	2 18	48	1 3	0·67	13
Malt culms	—	—	4 10†	1 6	3 4	43	1 6	0·80	16
Dried sugar beet pulp (*a*)	—	—	3 15	0 8	3 7	65	1 0	0·54	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of July, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 17s. per ton as shown above, the food value per ton is £6 3s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 9d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 8s. 8d.; P_2O_5, 3s. 1d.; K_2O, 3s. 4d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 2
Maize	81	6·8	4 12
Decorticated ground nut cake	73	41·0	7 5
„ cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·27 shillings, and per unit protein equivalent, 1·63 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values " which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 7
Oats	60	7·6	4 8
Barley	71	6·2	5 0
Potatoes	18	0·6	1 3
Swedes	7	0·7	0 10
Mangolds	7	0·4	0 10
Beans	66	20·0	5 16
Good meadow hay	37	4·6	2 14
Good oat straw	20	0·9	1 7
Good clover hay	38	7·0	3 0
Vetch and oat silage	13	1·6	0 19
Barley straw	23	0·7	1 10
Wheat straw	13	0·1	0 17
Bean straw	23	1·7	1 12

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6*d*. net.

* * * * * *

MISCELLANEOUS NOTES

Sodium Chlorate as a Weed Control

Ever since agriculture began, weeds have been one of the farmers' many difficulties, and much experimental work is now being conducted, especially in America and Australasia, in attempts to discover means of eradicating certain extremely troublesome species. In these investigations, sodium and other chlorates have been particularly considered.

Partly because of the results of certain American investigations, scientifically controlled experiments were carried out in 1928–29 and 1930, at the Research Station of Imperial Chemical Industries at Jealott's Hill, with the object of ascertaining the efficacy of sodium chlorate as a weed-exterminator on arable land and pasture.

Although the cost of the material does not suggest that it can yet be economically used in ordinary farm practice, the results are interesting as showing the toxic effect of sodium chlorate on vegetation and the time required for the land to recover. They are, therefore, recorded for the benefit of future investigation.

(1) An area of barley stubble, infested with creeping thistle (*Cirsium arvense* Hoffm.) and other weeds, was divided into ten one-hundredth acre plots, the numbers of thistles on which were recorded, while notes were made as to the presence of any other weeds. In the middle of October, sodium chlorate was applied to five of the plots at the rate of 180 lb. per acre, while the other five plots remained untreated. Rain fell within a few hours and eight days later the whole plant on the treated plots had wilted and turned brown. In the following March the whole of the plots, hitherto untouched, received the same cultural treatment as the rest of the field in preparation for a cabbage crop. At the end of May, when the cabbages were in the third and fourth leaf stage, the thistles were again counted. The following figures give the average number of thistles per plot before and after treatment.

	October, 1928	May, 1929
Control	447	557
Treated	458	47

The thistles on the control plots increased by almost 25 per cent., those on the treated plots were reduced by almost 90 per cent. Moreover, those remaining on the treated plots were noticeably less vigorous than those on the untreated plots. It appeared that the sodium chlorate killed the underground stems

to a depth of 6–9 inches. The toxic chlorate ions were clearly not present in the top soil after the winter, since the cabbages throve equally well on the treated and untreated plots.

(2) A few pasture plots were similarly treated at the same time as the arable experiment. Since chlorates are admittedly toxic to vegetation in general, preliminary tests were made to determine the degree of toxicity on plots receiving 180 lb. and 90 lb. respectively of sodium chlorate per acre. All vegetation was killed by both treatments, and no recovery occurred for several months.

(3) In 1930, the effects of an early spring application of sodium chlorate, and its persistence in the soil, were considered. On March 3, four plots (permanent pasture ploughed up in 1928–29 and sown with seeds mixture with rape as cover) were treated with 2 cwt. of sodium chlorate per acre, while other plots were used as controls. In mid-July the following numbers of weeds per square yard were counted :—

	Control	Treated	Decrease Per cent.
Cirsium arvense	10·3	3·4	67
Ranunculus repens ..	16·7	5·4	68
Angallis arvensis ..	2·1	1·7	19
Trifolium repens ..	0·9	2·0	+122(increase)
Agrostis spp.	1·5	1·3	13

These figures show that the spring application, although it was 20 per cent. heavier, was actually 25 per cent. less effective than the autumn one. Moreover, the thistles remaining after the spring application were as sturdy as those on the control plots.

(4) To consider how long sodium chlorate persisted in the soil, one-third of all the treated plots (see 3 above) were cross-drilled a fortnight after the March application with oats, red clover, Italian rye-grass, kale, beans, sugar beet and potatoes. Similar seeds were sown in the two remaining areas at intervals of one month and six weeks. Even after six weeks, no crop had established itself, oats being most susceptible and red clover most resistant. Further investigations showed that sodium chlorate had a toxic effect even after six months.

(5) The general results of the experiments indicate that the autumn application was very effective in killing all vegetation, and that it was possible to plant cabbages in the following May with perfect safety. The early spring application, on the other hand, was far less effective, and subsequent planting was delayed until the following autumn.

The present cost of the material renders it unlikely that the treatment can at present be economically used in ordinary farm practice, but it may be useful for small areas in special cases.

* * * * * *

United Dairies' Scholarships

THE annual award of scholarships from the United Dairies Scholarship Fund was announced recently. This fund, amounting to £30,000, was created by the United Dairies, Ltd., in 1924, for the purpose of promoting and encouraging practical and scientific education in dairying and dairy farming. The income is administered by an advisory committee representative of the Ministry, the County Councils of Cornwall, Devon, Dorset and Somerset, certain agricultural colleges, the National Farmers' Union and the United Dairies, Ltd. The scholarships, which are available for the sons and daughters of farmers and smallholders in the above-mentioned counties, are tenable at various agricultural colleges.

This year there were more applications than usual, and the award consisted of eleven scholarships and three extensions, the figures for the previous twelve months being seven and two, respectively. For the first time, also, this award includes a travelling scholarship.

The names of successful candidates are as follows:

Reading University—
Three-Year Degree Course in Agriculture: W. R. Trehane.
Two-Year Diploma Course in Dairying: E. M. Laity, R. West.
One-Year Extension Diploma Course in Dairying: G. B. Read.
One-Year Extension Course in Dairying: S. L. Huthnance.

Seale-Hayne Agricultural College—
One-Year Course in Agriculture: J. L. Congdon.

Somerset Farm Institute, Cannington—
One-Year Course in Dairying: E. E. Creed, A. P. Harris, I. G. Roberts.
Two-Term Course in Dairying: D. C. Board, E. A. R. Duckett.
Two-Term Extension Course in Dairying: M. E. Cottle.

Sparsholt Farm Institute—
One-Year Dairying Course: D. Harvey.

Armstrong College, Durham University—
One-Year Dairying Course: T. W. Lewis.

Travelling Scholarship in England—
H. H. Mitchell.

Export of Breeding Stock

NUMBER and declared value of animals, living for breeding, exported from Great Britain and Northern Ireland in the three months ended June, 1931, compared with the corresponding period of 1930. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	April to June, 1931		April to June, 1930	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	43	7,226	140	22,255
Belgium	37	783	0	0
Brazil	2	300	28	2,485
Italy	48	2,600	0	0
Uruguay	28	2,715	41	5,280
United States of America	0	0	57	5,183
Australia	0	0	50	5,400
Canada	28	2,800	226	15,335
Irish Free State	338	7,140	489	14,119
Kenya	9	466	15	914
Union of South Africa	10	910	17	1,082
Other countries	0	0	19	1,095
Total	543	24,940	1,082	73,148
SHEEP AND LAMBS				
Brazil	0	0	84	1,845
France	44	460	37	344
Spain	14	206	0	0
Sweden	0	0	27	612
United States of America	0	0	122	1,847
Australia	0	0	16	272
Canada	11	110	369	6,102
Irish Free State	7	98	14	158
Union of South Africa	6	100	54	685
Other countries	0	0	15	585
Total	82	974	738	12,450
SWINE				
France	42	678	9	145
Germany	1	21	10	360
Italy	41	420	1	5
Morocco	5	75	0	0
Poland	10	300	1	25
Portugal	1	25	3	120
Switzerland	11	240	0	0
Irish Free State	4	43	48	600
Union of South Africa	1	30	9	230
Other countries	2	13	6	154
Total	118	1,845	87	1,639

Poultry-Keeping on the Farm

MR. E. REA having left Middlesex to take up the post of Agricultural Organizer for Gloucestershire, Mr. J. Worthington, the Poultry Instructor for Middlesex, has communicated the following note, dealing with the further progress of the Poultry Demonstration at Stanmore during the three months ended June, 1931. Previous notes on this subject were published in the issues of this JOURNAL for May (p. 217) and July (p. 447) this year. It may be remembered that this Demonstration, which has been made possible through the generosity of Sir John FitzGerald, is to show a suitable method of poultry-keeping on the farm, using slatted-floor houses.

Feeding and Management.—These have been generally described in previous notes. The grain has been gradually reduced and the proportion of maize in the ration has been halved. The ration used during the period under review consisted of meat and bone meal, decorticated ground-nut cake meal, maize meal, broad bran and middlings. Just over 10 tons of food were consumed during the period in question, the cost being about £6 12s. 6d. per ton.

Four runs have been rested for 10 weeks. In changing the birds over to fresh runs, it was found easier to drive the flocks from the old to the new runs. Previously, they had been moved in the houses, which had to be returned to the original pens, and this form of removal proved to be rather laborious.

It has become evident that the present rate of stocking is too high. There are signs that where the turf has been badly worn, weeds are taking the place of herbage. The contrast between the runs and those alongside, where the laying-trial birds are housed (also at the rate of 200 per acre) is striking. Incidentally, it has been noticed that the laying-trial birds retire to roost at least half an hour earlier than the demonstration birds. The latter, moreover, appear to lay later in the day, and it is not uncommon to find a number of eggs laid on the grass just before dusk.

Egg Production.—Since the peak figure was reached in the last week in March, the daily production of eggs has steadily declined from about 700 to 500. It should be understood, however, that the stock has been reduced to 900 birds, partly by culling and partly by casualties. In the three months under review, 52,222 saleable and 1,714 defective eggs were produced, making a total of 138,754 to June 30.

If the number of defective eggs seems excessive, it must be

remembered that the eggs are handled a number of times, being collected, washed (if necessary), graded and packed, before any deductions are made. The attraction that certain nests appear to have for individual birds, resulting, at times, in crowding and consequent breakages, makes a certain amount of wastage inevitable with the type of nest in use. It is seriously suggested that the usual type of nesting arrangement is not satisfactory, especially for the general farmer, who, as a rule, collects eggs only once a day. A better nest would not have divisions, which simply encourage crowding. A gently-sloping floor would carry the egg rearwards, through a gap at the back, to a suitable place of safety, with sufficient accommodation to allow of one daily collection. It is hoped to experiment on these lines with various designs; extra cost in construction should be amply covered by the saving on breakages. Such an arrangement would also prevent egg-eating. This vice, noted in one pen, was stopped by fitting a false, sloping floor to the nests, so that the eggs disappeared from the nest immediately after laying.

The size of the eggs has been rather disappointing, possibly on account of the breed of the pullets, the majority being half-bred Wyandottes. On the other hand, the eggs are retailed locally, where there is no strong demand for special grade eggs.

Less washing of eggs has been needed than was anticipated, and this may be attributed to the frequent collections and to the fact that the birds, to reach the nests, have to walk the full length of the floor, which keeps surprisingly clean.

Broodiness has not been excessive and has been fairly easy to cure. Birds found in the nests at night have been removed to night arks in small runs, although, as is usual with this method of treatment, a number have been injured in resultant fighting. A large proportion of these birds, on return to their respective pens, commenced to moult, but moulting did not become general.

Health.—During the second week in April, many birds were observed to carry body lice, but, possibly through an increased use of dust baths, the pests were little in evidence at the end of the period. During the three months 42 birds have died or were destroyed mainly on account of ovarian disorders, bringing the total casualties to 82. Although some birds were hurt whilst using the alighting board (also slatted) in front of the nests, very few accidents have been due to the slatted floors.

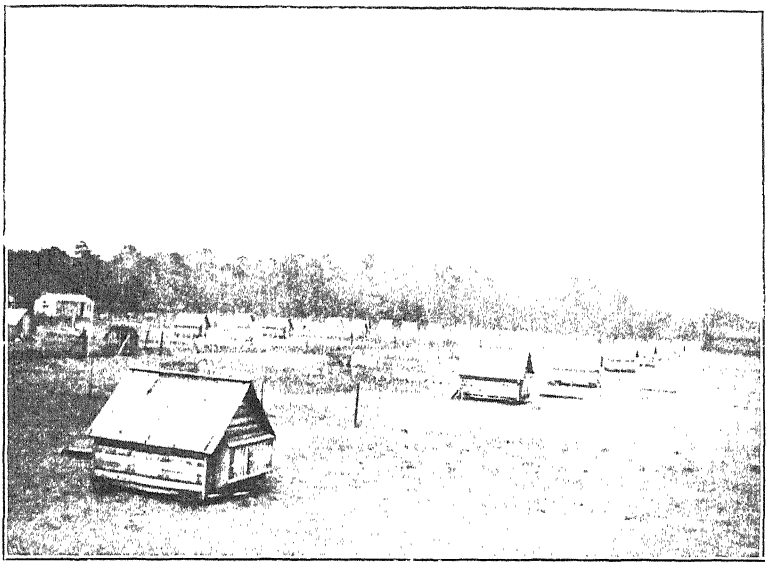


FIG. 1.—General view of the 1,000-bird plant, Stanmore, Middlesex, looking north-east.

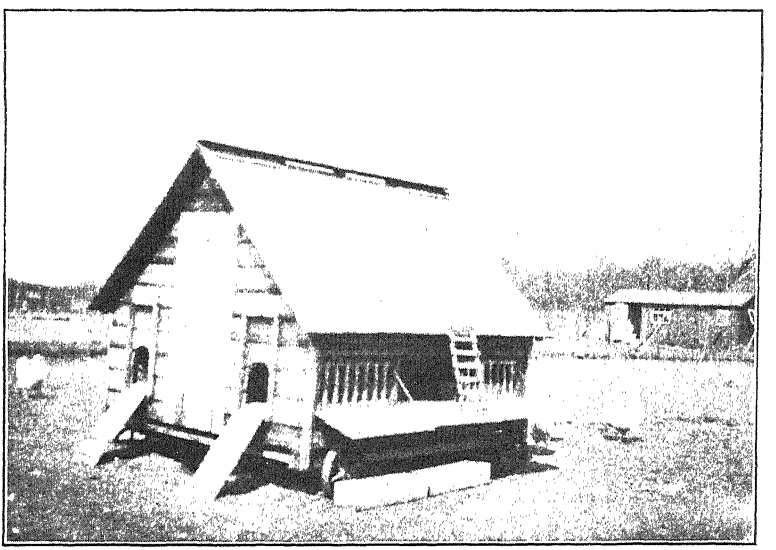


FIG. 2.—Slatted floor house, showing ridge ventilation, roof lighting, and food hopper accessible from both inside and outside.

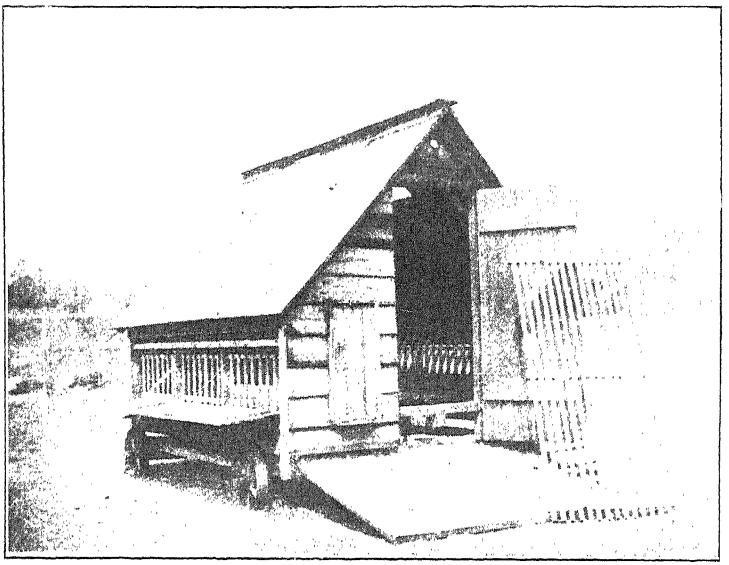


FIG. 3.—Slatted floor house, showing detachable slatted floor, metal dropping-tray, and indoor and outdoor feeding.

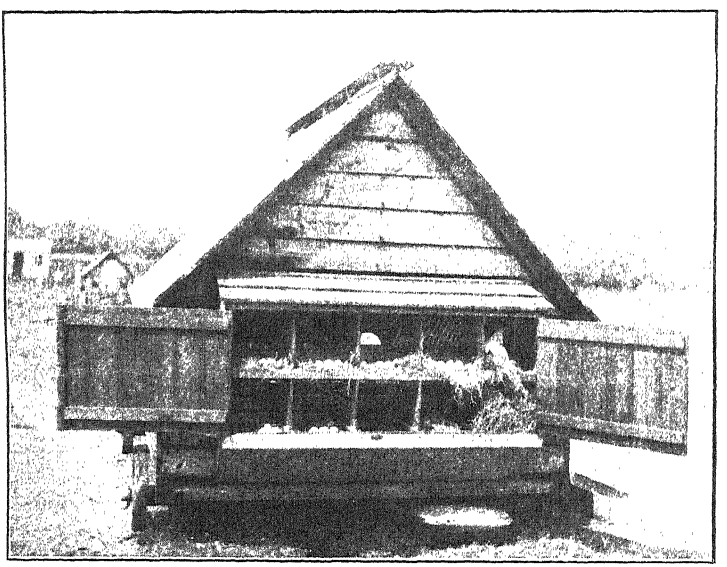


FIG. 4.—Slatted floor house, showing nests.

Culling.—In addition to the death roll, 42 birds have been culled, so that the stock figure at the end of the period was 900, as already stated. Of this total, 100 were segregated, to be culled as they went off laying.

Replacements.—An order was placed in the spring for 250 first-cross pullets—White Leghorn × Rhode Island Red. These were delivered and settled in their new quarters. As a temporary measure, the houses were lowered to their axles to prevent birds sleeping below the trays. Incidentally, it has been noticed that the birds go into the houses for feeding and for shade much more than last year, when the houses were on wheels. As regards the new birds, it is proposed to keep the cost account for feeding separate from that of the main flock.

* * * * * *

The Agricultural Index Number

PRICES of agricultural produce in July were on average 21 per cent. higher than in 1911–13, as compared with 23 per cent. in June. At the corresponding period a year ago, the index number rose by 3 points to 34 per cent. above pre-war. The fall of 2 points on the month was due mainly to the lower indices recorded for barley, fat sheep, fat pigs and potatoes, which, however, were partially offset by advances in the index figures for fat cattle and dairy produce.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August..	49	42	44	52	35	—
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Quotations for wheat were again slightly higher, and the index number advanced by one point on the month to 23 per cent. below pre-war. Barley, however, showed a sharp fall in price to an average of 6*s.* 1*d.* per cwt. and the index

figure fell by 10 points to 19 per cent. below the level of the base years. Values for oats were little altered from those ruling in June, but the index was 2 points lower.

Live Stock.—Fat cattle sold at about the same figures as in the preceding month, but owing to a fall occurring between June and July of the base years, the index number rose by 6 points to 29 per cent. above pre-war. Prices of fat sheep declined by about ½*d.* per lb. and the index number by 7 points to 38 per cent. in excess of 1911–13. Quotations for fat pigs receded for the fifth month in succession ; both baconers and porkers showed a fall of about 11*d.* per score lb., and the respective index numbers were 11 and 10 points lower. Bacon pigs are now selling at pre-war prices while porkers are only 10 per cent. dearer. Values for dairy cows appreciated by fully £1 per head and the index number rose by 4 points. Store cattle were rather cheaper, but as the reduction was less pronounced than in the base years, the index figure showed a rise of 3 points. Similarly, store sheep were lower in price, but the index was 8 points higher on the month. The decline in store pig prices showed no sign of being arrested, the average in July being about 3*s.* per head lower than in June.

Dairy and Poultry Produce.—The contract price of milk during the month under review was on average ¼*d.* per gallon higher than in June, and the index figure rose by 4 points to 52 per cent. above pre-war. Butter also was rather dearer. Cheese was a little cheaper, but as a proportionately heavier fall occurred in the base period, the index number was 3 points higher. Prices of eggs followed the upward course usual at this season, and the index number advanced by 17 points to 19 per cent. in excess of 1911–13. A year ago, eggs were 44 per cent. dearer than pre-war. The index for poultry showed a drop of 8 points on the month.

Other Commodities.—With the change over from old to first early potatoes, the average price calculated for index number purposes showed a rise, which, however, was not so marked as in the base years. Accordingly, the index figure dropped by 21 points to 79 per cent. above the level of 1911–13. A year ago, the index number was much lower at only 23 per cent. above pre-war. Hay was again cheaper at 13 per cent. less than in 1911–13, while wool showed a further slight fall in price. Apples were considerably dearer than in the corresponding month last year, while black currants, red currants and gooseberries were a little higher in price. Cherries and strawberries, however, were much cheaper, raspberries also showing some

reduction. In the case of strawberries, a fall in price of over 50 per cent. occurred between June and July.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	July	July	Apr.	May	June	July
Wheat	28	2	—32*	—28*	—24*	—23*
Barley	30	—12*	— 2*	—10*	—9*	—19*
Oats	23	—20*	—15*	—11*	—10*	—12*
Fat cattle	30	30	20	19	23	29
„ sheep	55	66	37	40	45	38
Bacon pigs	64	40	23	21	11	Nil.
Pork „	61	49	40	33	20	10
Dairy cows	33	32	28	24	23	27
Store cattle	25	29	23	25	28	31
„ sheep	60	78	31	28	45	53
„ pigs	80	100	63	52	41	31
Eggs	57	44	18	7	2	19
Poultry	57	47	42	63	52	44
Milk	57	58	53	47	48	52
Butter	52	31	15	8	7	10
Cheese	67	32	24	22	25	28
Potatoes	—4*	23	82	85	100	79
Hay	29	18	—10*	—10*	—11*	—13*
Wool	45	—4*	—16*	—21*	—32*	—34*

* Decrease.

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Courses at County Farm Institutes

THERE are 17 County Farm Institutes in England and Wales. Their primary object is to provide instruction in the scientific principles underlying sound farming practice and they have been specially and extensively equipped for the purpose. The instruction given is closely related to practice; this applies not only to general agriculture, but also to market-gardening, fruit-growing, dairying and poultry-keeping. The subjects dealt with and their order of importance vary somewhat at the different institutes, but a typical curriculum includes the following: soils, manures, crops, livestock, feeding stuffs, implements and machinery, veterinary hygiene, surveying and mensuration, farm book-keeping, general agricultural science (biology and chemistry), horticulture, dairying, poultry-keeping, bee-keeping, and fungus and insect pests. Most of the courses start in October, one term being taken before Christmas and one after, but in some instances a full year's course is provided. Facilities are also provided for short courses in special subjects, and most

of the institutes provide instruction for women, particularly in such subjects as dairying, horticulture and poultry-keeping.

The institutes are situated in the following counties :—

Cheshire (at Reaseheath, near Nantwich); Cumberland and Westmorland (at Newton Rigg, near Penrith); Essex (at Chelmsford); Hampshire (at Sparsholt, near Winchester); Hertfordshire (at Oaklands, near St. Albans); Kent (at Borden, near Sittingbourne); Lancashire (at Hutton, near Preston); Lincolnshire, Holland (at Kirton, near Boston); Northamptonshire (at Moulton, Northampton); Somerset (at Cannington, near Bridgwater); Staffordshire (at Rodbaston, Penkridge); Suffolk: the Chadacre Agricultural Institute (at Hartest, Bury St. Edmunds); East Sussex (at Plumpton); Caernarvonshire (at Madryn Castle, Bodfean); Carmarthenshire (at Carmarthen); Denbighshire (at Ruthin); and Monmouthshire (at Usk, Newport).

A certain number of scholarships tenable at the institutes are awarded by County Councils to residents in their area, and the Ministry itself awards similar scholarships for the sons and daughters of agricultural workers.

Brief particulars of the courses for the session 1931–32 are contained in a leaflet (Form No. 732/T.E.), which can be obtained from the Ministry; more detailed information will be furnished by the Principal of the Institute concerned. Anyone desirous of attending one of the courses commencing in October should make immediate application to the Principal of the institute concerned.

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National Rabbit Council

THE Year-Book of the National Rabbit Council, just issued under the title *Rabbits*, 1931, contains a large amount of matter that should be useful to those engaged in this important and growing industry. Articles of Constitution and other data concerning the Council are followed by the Report of the Veterinary Adviser, who emphasizes the need for further research in regard to diseases of rabbits. Summaries are given of the principal papers read at the International Congress of Rabbit Breeders held at Leipzig last year. Several speakers referred to the new Rex variety, making valuable suggestions as to breeding, feeding, management and pelt characters. Professor F. A. E. Crew offers "Thoughts concerning the Improvement of the Rabbit Industry," urging the adoption of national schemes for increased production, for continuous improvement, for marketing and grading of pro-

ducts, and "an international agreement upon standards." The improvement of breeds, he thinks, is largely dependent on improvement of the breeders' education in matters relating to the industry. Mr. D. Fairfoul writes on "The Production of Undyed Coney Furs" and Mr. T. Leaver on "The Future of Undyed Coney Fur." "Fur Farming" events in 1930 are reviewed by Major R. D. H. Simmons, while Messrs. Minchin and Matthews write on the progress of Angora wool farming during the year. Mr. J. Hammond contributes a chapter on "Growth of the Rabbit in Relation to Flesh Production," in which he points to the need for further scientific research as to the best time for killing. An article on "The Marketing of Cultivated Rabbit Carcasses" by the Secretary summarizes the procedure for killing, dressing, packing and marketing as approved by the principal London buyers. "Rabbit Flesh," by Mr. King Wilson, gives results of investigations showing edible rabbit meat to be very similar to chicken flesh in quantitative protein content. Copies of this useful publication may be obtained from the Honorary Secretary, Dr. J. N. Pickard, Animal Breeding Research Station, King's Buildings, West Mains Road, Edinburgh, price 1*s.* 6*d.*

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Midland College Poultry Conference

THE Eighth Annual Poultry Conference of the Midland Agricultural College, Sutton Bonnington, Loughborough, will be held on Tuesday, September 22, 1931, commencing at 10.45 a.m., when Mr. P. A. Francis, O.B.E., Poultry Commissioner to the Ministry, will occupy the chair. Four papers will be read, speakers and subjects being as follows:—Mr. E. Collier, "The Lancashire Official Pedigree Breeding Station"; Mr. J. Meekings, "Slatted Floor Houses for Chickens and Adult Stock"; Miss N. B. Maddison, "Breeding and its Problems"; and Mr. T. M. Doyle, F.R.C.V.S., "Poultry Diseases" (illustrated by lantern slides). A discussion will follow each paper, the openers being, respectively, Mr. G. W. Brindley, Country Poultry Instructor, Derby; Mr. A. Tyler, County Poultry Inspector, Lindsey; Mr. G. A. Palmer; and Mr. H. T. Atkinson, N.D.P., County Poultry Instructor, Leicester. At the afternoon session, a challenge cup will be presented to the winner in the Inter-County Laying Trials. Particulars of the arrangements, accommodation for visitors, refreshments, etc., can be obtained on application to the Principal, Dr. T. Milburn, at the above address.

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held on July 28, 1931, at 7 Whitehall Place, London, S.W.1, the right hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders carrying into effect the Committees' decisions.

Berkshire.—An Order cancelling as from August 1 the minimum and overtime rates at present in force and fixing fresh rates to operate as from August 2 until December 19, 1931. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 52½ hours (instead of 50 hours as at present), with overtime at 8½*d.* per hour. In the case of female workers of 19 years of age and over the minimum rate is 5*d.* per hour for all time worked.

Cambridgeshire.—An Order fixing special minimum rates of wages for the employment of male and female workers on the corn harvest in 1931. The rate in the case of male workers of 21 years of age and over is £11 for a period of four weeks of 64 hours per week (excluding Sundays), with payment for Sunday work and for employment in excess of 64 hours per week at 11*d.* per hour. The special minimum rate for female workers of 18 years of age and over is 8*d.* per hour for all employment on harvest work. This Order does not apply to workers hired on a day to day contract to assist in harvest work and whose total period of employment on harvest work does not exceed 14 days with any one employer.

Essex.—An Order fixing special overtime rates of wages for male workers and special minimum rates of wages for female workers during the corn harvest in 1931. In the case of male workers of 21 years of age and over the special rate for overtime employment on harvest work is 10*d.* per hour. In the case of female workers of 21 years of age and over the minimum rate payable for all employment on harvest work is 7*d.* per hour.

Shropshire.—An Order cancelling as from August 8 the minimum and overtime rates of wages at present in force and fixing fresh rates to operate as from August 9 until further notice. The minimum rate in the case of male workers of 21 years of age and over is 31*s.* 6*d.* (instead of 32*s.* 6*d.* per week as at present) per week of 44½ hours in the weeks in which Christmas Day falls in 1931 and 1932, and in the week in which Good Friday falls in 1932, and 54 hours in any other week. The overtime rate for male workers of 21 years of age and over is 9*d.* per hour except for employment on Sunday on work other than the care of and attention to livestock (including milking) when the rate is 10*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6*d.* per hour.

Suffolk.—An Order fixing special minimum rates of wages for the employment of male workers during the corn harvest in 1931, the rates for such workers of 21 years of age and over being :—

(*a*) In the case of farms of at least 60 acres of corn, £5 for the harvest in addition to the minimum weekly wage and in lieu of overtime rates, the hours in respect of which this rate is payable being 12 on any weekday whilst the crops are being carted and 11 whilst other harvest work is in progress, but so that the hours in any one week shall not exceed 70 ; where a worker is employed for part only of the harvest the special minimum rate is 10*d.* per hour for all employment on harvest work ;

(*b*) In the case of farms of less than 60 acres of corn 10*d*. per hour for all employment on harvest work.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ended August 14, legal proceedings were instituted against 17 employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Derby ..	Ashbourne .	*	0 10 6	2 11 0	1
,, ..	,, ..	*	0 13 0	18 0 0	2
,, ..	,, ..	*	0 10 6	10 17 6	1
,, ..	,, ..	*	0 10 6	3 11 0	1
,, ..	Belper ..	–	0 13 0	22 0 0	1
,, ..	Hatton ..	*	1 14 0	59 0 0	2
,, ..	,, ..	*	1 7 6	23 2 6	1
,, ..	,, ..	*	0 10 6	15 16 10	2
,, ..	Heanor ..	1 0 0	—	8 5 0	1
Stafford ..	Cheadle ..	0 10 0	0 10 6	9 0 0	1
,, ..	,, ..	†	—	—	1
,, ..	Leek ..	*	0 8 0	4 0 0	1
,, ..	,, ..	*	0 8 0	35 0 0	1
,, ..	,, ..	*	0 8 0	5 0 0	1
Yorks, N.R. .	Thirsk ..	*	1 14 6	12 5 4	2
Denbigh ..	Ruthin ..	*	1 17 0	5 17 0	2
,, ..	,, ..	*	1 17 0	3 1 6	2
		£1 10 0	£13 12 6	£237 7 8	23

* Dismissed under Probation of Offenders Act. † Dismissed.

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Foot-and-Mouth Disease.—Since the last issue of this JOURNAL went to Press, seven outbreaks of Foot-and-Mouth Disease have been found to exist in Bedfordshire. These cases have necessitated the declaration of an Infected Area covering parts of the counties of Bedford, Huntingdon, Cambridge, Hertford, Buckingham, and Northampton. This is now the only Foot-and Mouth Disease Infected Area in Great Britain.

All exceptional restrictions in connexion with the importation into Great Britain of cattle, sheep, goats and pigs from Ireland, which were imposed in consequence of the existence of Foot-and-Mouth-Disease in County Down, have now been withdrawn.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Hertfordshire.—Mr. R. G. Ferguson, M.Agr., has been appointed Lecturer in Agriculture, *vice* Mr. H. R. Williams, B.Sc.

Somersetshire.—Mr. G. G. Gregory, N.D.A., has been appointed Vice-Principal of Cannington Court Farm Institute, *vice* Mr. C. F. Porteous, N.D.A., N.D.D., B.D.F.D.

Sussex (West).—Miss C. E. Day, N.D.P., has been appointed Manageress of the County Egg-Laying Trials, *vice* Miss K. Elliot, N.D.P.

WALES

Carmarthen.—Miss P. M. Jones, Instructress in Rural Domestic Economy, has resigned.

PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

The Horticultural College for Women, Swanley, Kent

Miss Catherine Cassels Steele, M.A., B.Sc., Ph.D., has been appointed Lecturer in Chemistry and Physics, *vice* Miss H. G. Mitchell, resigned.

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NOTICES OF BOOKS

Range Sheep and Wool in the Seventeen Western States.—By F. S. Hultz, M.S., Ph.D., and J. A. Hill, B.Sc. Pp. xvii + 374. (New York: Wiley; London: Chapman & Hall. 1931. Price 15*s.* net.)

This volume aims at presenting a comprehensive view of the range sheep and wool industry as practised in the western States of America. The first part (by Dr. Hultz) discusses the history, breeds, diseases, feeding, management and marketing of range sheep. Part II (by Mr. Hill) contains chapters on the present status, classification, manufacture and marketing of wool, wool fibre, and the judging of range sheep for wool, followed by a glossary of terms used in the trade. The text is illustrated by 78 figures of a practical character, both combining to form a useful manual on the subject.

The Role of Atomic Energy in the Nutrition of Animals and Plants. (*Die Rolle der Atomenergie bei der Ernährung von Tier und Pflanze.*) By L. Kaul and A. Riedle. Pp. 205. (Munich: F. P. Datterer & Co. Paper covers, mks.7.50; cloth, mks.9.50.)

This volume is advertised on the title-page as a "handbook for nutritional physiologists, agricultural advisers, educated practical farmers, veterinary surgeons, medical practitioners, chemists, physicists and all who seek enlightenment on the processes of nutrition in plants, animals and human beings." The authors evidently are not anxious to limit the scope of the book's appeal, but for the benefit of English readers, it should be pointed out that its intelligent perusal demands not only a sound knowledge of German, but an expert's grasp of the modern trend in the sciences of chemistry, physics and biochemistry.

Indeed, it is primarily a book for the biochemist, and by him it should certainly be read and studied, for it is no ordinary textbook written on conventional lines, but is characterized by its frank disregard of orthodox teachings. It possesses a fascination for the reader that cannot be conveyed within the limits of a short review. The authors deal with the most fundamental phenomena in plant and animal life from a new standpoint, namely, that of atomic energy. "Life is not a substance but a force." Starting out from the conception of matter as having been elaborated, by the path of helium units, from hydrogen atoms, they propound the theorem that "all the physical and chemical processes in the universe must be capable of being traced back to one common starting point, namely, the organization of the forces ('Kraftorganization') in the hydrogen atom"; for since hydrogen atoms are the precursors of helium atoms, and since the latter are the building-stones from which the bigger atoms are formed, it follows that groups of such atoms, right up to the heaviest Uranium system, are held together only as a consequence of the

operation of the "Kraftorganisation" of the hydrogen atom. The atom of hydrogen is pictured as being composed of an electrically-charged sub-atomic "unus" to which are attached three other sub-atomic "uni" of opposite charge.

It is not possible in a brief notice to trace the devious and intricate arguments whereby this doctrine of atomic energy is unfolded. Suffice it to say that, with the help of its teachings, the authors are able to shed light on many problems which hitherto have baffled the bio-chemist, such as the relation of taste, smell and toxicity to molecular structure, the reason for the potent physiological action of substances such as adrenalin, the explanation of the power of enzymes to split up complex substances into compounds of simpler structure. The activities of vitamins and hormones are discussed in the light of atomic energy, whilst other chapters are devoted to such fundamental matters as the function of atomic energy in the building-up of plant and animal products; its significance in relation to the diseases of plants and animals; the role which it plays in the production of breeds and races by climatic, soil and nutritional factors, and its influence in the processes of animal and plant breeding.

It is scarcely necessary to add that this dissertation on atomic energy in relation to the vital processes embodies much that provokes argument and conjecture. Chemists in particular will be intrigued by the authors' disregard of conventional formulæ; it is startling, for example, to meet with such formulæ as CH_2COOH_2 for acetic acid and $C_3H_2(OH_2)_3$ for glycerol. None the less, the reader will not fail to be deeply interested in this latest attempt to fathom the profundities of the problems connected with the living organism.

The Midlands Grazing Industry. A Study of the Relative Economic Advantages of Grazing Young or Old Cattle. By A. Bridges, M.A., and Arthur Jones, B.Sc., B.Litt. Pp. 55. (Oxford: Clarendon Press; London: Humphrey Milford. 1931. Price 2*s*.)

This work is a study of the returns obtained during 1928 from cattle grazing in the Leicestershire-Northamptonshire area. The main purpose was to discover the relative advantages of grazing young cattle as compared with those of three years old and over. Several points of importance have emerged. There is, for instance, a preference for bullocks, and for those of three years old, in the neighbourhood of Harborough, and it is claimed by the graziers that on these strong pastures the best grazing results are only obtained from cattle of this age. In the more remote area described as Ex-Harborough, younger animals seem to be preferred and there is a preponderance of heifers. These animals are usually grazed on mixed farms. Some of the smaller graziers also state that there is a difficulty in getting supplies of stores at the local markets because many farmers who used to rear and sell store cattle are now finishing them. Milk producers do not rear so many cattle as formerly, and the number of dealers bringing stores from Ireland and Wales to the Leicester and Market Harborough markets has declined considerably, with the result that stores have to be bought from farther afield.

A factor of importance in profit earning appears to be cake feeding. The younger cattle, especially those fed cake throughout the grazing season, were by no means more profitable than the three-year-olds which received practically no cake. Arising out of this conclusion, the authors suggest that the question of the best feeding stuffs for fattening cattle on grass is one that might receive more consideration on the part of graziers. The older cattle have the advantage of capturing the market in the earlier part of the season when prices are normally high.

The authors question the widely-stated decline in demand for the larger and older beast. They state that modifications in management would seem to be putting on the market a sufficient supply of young beef in small joints such as are demanded by household buyers. They maintain, however, that the demand from hotels, restaurants and other such institutions for larger types of joint is keeping up sufficiently to justify the continuance of the practice of grazing the older animals. It is, of course, not possible to indicate the complete results obtained in a brief review; but the pamphlet can be recommended as of paramount interest to graziers.

An Economic and Financial Analysis of Sixteen East Anglian Farms, 1927-29—with Special Reference to the Economic Aspects of the Rationing of Livestock. By W. H. Kirkpatrick, University of Cambridge, Farm Economics Branch. Report No. 17. Pp. 21 and six tables. (Cambridge: W. Heffer & Sons, Ltd. Cambridge, 1931. Price 1*s.* net.)

Reports of the Farm Economics Branch of the University of Cambridge are sufficiently familiar to readers of this JOURNAL to need little recommendation. The present study was undertaken for the purpose of comparing as far as possible the feeding standards on the costed farms with those suggested by scientific research. After careful consideration of the working of the farms and their economic results, the author has discussed the question whether the systems of feeding adopted were or were not compatible with the principles of scientific rationing that have been laid down as a result of research. Although in farming practice it is not altogether possible to adopt the precision which is a *sine qua non* of a scientific experiment, the measure of coincidence between the rations fed on these farms and on those that would have been recommended by strictly scientific feeding is surprising. There are, of course, divergences from the practice advocated in *Rations for Livestock*, which Mr. Kirkpatrick has taken as the scientific standard, but these are not nearly so great as one might reasonably have suspected. A detailed perusal of the report is, however, required before one can appreciate how nearly practice approaches science on these farms in Eastern Anglia.

An Agricultural Atlas of Scotland. By H. J. Wood. Pp. 64, with 16 plates and three maps in text. (London: George Gill & Sons, Ltd., 1931. Price 3*s.* 6*d.* net.)

We have already had an *Agricultural Atlas of England and Wales* that has proved the value of this type of production. The present survey of Scotland is produced on much the same lines, and thus makes available similar information for the whole of Great Britain. The value of this kind of geography is not by any means confined to the school or university student, but is of service to the specialist in making clearly visible the variations in the type of agriculture over wide areas. As the writer of the introduction says, the collection of accurate data sometimes shatters our favourite illusions, and he goes on to ask, "Where, for example, are the shaggy Highland Cattle beloved of the artist?" A glance at Plate 14 makes this point clear.

The graphs showing the historical fluctuations of some of the crops during the period since the collection of agricultural statistics are instructive, and are useful for comparison with the rather similar changes that have taken place in England and Wales.

The author is Assistant Lecturer in Geography at King's College, London University, and this work is the result not only of the study of printed sources, but of a personal inspection of much of the ground.

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NOTES FOR THE MONTH

Agricultural Wages Regulation in England and Wales

THE Report of Proceedings under the Agricultural Wages (Regulation) Act, 1924, for the period from October 1, 1928, to September 30, 1930, which has just been issued,* differs from that of its predecessors. An endeavour has been made to bring together, in the earlier part, the more important facts, summarizing the principal matters that have occurred during the period under review, and to supplement these by some general conclusions reached as a result of six years' experience in the administration of the Act. The second part has been reserved for other statements of fact, statistical information, etc., which, although of importance as a record, are chiefly of value for future reference.

The Report shows that the average weekly minimum wage for ordinary adult male workers remained constant during the two years at approximately 31*s.* 8*d.* This figure takes no account of overtime payments or of additional earnings at special seasons such as harvest time. From the inspections carried out by the Ministry's staff it is estimated that the total weekly wages paid to ordinary farm workers in England and Wales during the two years averaged 33*s.* 8*d.*, including the value of any allowances in kind such as a provided cottage and milk or potatoes that workers may receive from their employers. The similar average figure for horsemen is 37*s.* 5*d.* per week and for stockmen 39*s.* 1*d.* per week.

During the period reviewed in the report every farm employing paid labour was visited in selected areas in Wiltshire, Monmouthshire, Radnor and Brecon, Montgomery and the West Riding of Yorkshire in order to ascertain

* The Report can be obtained through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2*s.* net, post free 2*s.* 3*d.*

to what extent the Orders of the local Agricultural Wages Committees were being observed. The results are extremely interesting. Of the 3,553 workers whose wages were investigated, 20·6 per cent. were receiving less than the authorized wage to which they were entitled. The proportion underpaid varied from 14 per cent. in Wiltshire to 32 per cent. in Monmouthshire. Included in this number were 5·5 per cent. of workers who were receiving less than the bare minimum wage authorized for their area. As a result of these inspections, and of the investigation of specific complaints received by the Ministry during the two years ended September, 1930, a sum of over £28,000 was collected from farmers for arrears of wages and 270 prosecutions were instituted by the Ministry for contraventions of the Act.

The part of the Report, however, that is likely to attract most attention is not the record of the work undertaken by the Ministry during the two years, but the interesting review of the results of wage regulation in the agricultural industry in England and Wales. It is pointed out that for a period of four years, 1917-1921, wage regulation in agriculture was in operation under the provisions of the Corn Production Act, 1917. There was then an interregnum from 1921 until the present Act was placed on the Statute Book in 1924. Taking the two periods together, agricultural wages have been regulated by Statute in England and Wales for ten years.

The Report points out that whereas from 1917-1921 war prices prevailed and the profits of the industry were high, during the period since 1924 conditions in the agricultural industry in England and Wales, as throughout the world, have been unsatisfactory, profits have been dwindling and in certain districts only the exceptional farmer has made any profit at all. At the same time, the Report maintains that it would be a mistake to think that non-observance of minimum Wage Orders is a direct corollary of agricultural depression. The Ministry is of opinion that the two things are in no way related. "One of the principal aims of wage regulation is to bring up to the level of the best employers those who owing to ignorance or for some other reason would lag behind." It is not, however, only with employers that the Ministry experiences difficulty: it is indicated in the Report that the Department is also familiar with instances in which a worker makes a practice of engaging himself for less than the authorized minimum wage and applies again and again to the Ministry to collect arrears alleged to be due.

As to the effect of wage legislation on the industry itself, the Report points out that the first broad result has been that the revenue gained by the industry has been distributed between employer and worker in a different proportion than would otherwise have been the case. This means that while the employee is receiving more for his services than he or his predecessor on the farm did before the War, the farmer is frequently receiving less for his services and as a return on the capital invested than he did twenty years ago. The Ministry also recognizes that the existence of the minimum wage makes it difficult for farmers to employ economically certain types of rural workers who, if not mentally or physically deficient to an extent that would entitle them to exemption from the minimum rates, are, nevertheless, far removed from the fully able-bodied type of farm hand who can be entrusted with any ordinary job that comes along.

The Report summarizes the principal features of the agricultural labour situation in England and Wales since the passing of the Agricultural Wages (Regulation) Act, 1924, as follows :—

(i) increased receipts by agricultural workers ;
(ii) heavier labour costs to farmers which, while they have been set off to some extent by reductions in staffs, have accentuated the depression brought about by the heavy fall in the prices realizable for agricultural produce ;
(iii) less secure employment for workers in the arable districts during the winter months ;
(iv) improved labour organization and management on a number of farms previously conducted in a haphazard manner ; and
(v) labour disputes, strikes and lockouts have been avoided.

It is observed, however, that apart from these material results, wage regulation in agriculture " has been associated with an indirect or psychological change to which many persons familiar with the conditions in the countryside attach great importance. The relationship between employer and worker has altered and is still altering. The old relationship which existed up to 20 or less years ago varied greatly from farm to farm. A good employer treated his worker as an old and trusted friend. On the other hand, a bad employer treated his employees as little more than serfs. In neither case were the hours of employment numbered or discussed. These conditions are gradually being altered and new conditions

more comparable with those obtaining in the industrial world are taking place. It would not be true to say that this change is due solely to wage regulation, although it has contributed to the result."

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National Rat Week, 1931

NATIONAL Rat Week has been fixed this year for the week commencing Monday, November 2, and the Ministry has again addressed a circular letter to all the local authorities who exercise powers and duties under the Rats and Mice (Destruction) Act, 1919, impressing upon them the desirability of making a special effort during that week to secure concerted action for the destruction of rats and mice.

It is generally recognized throughout the country that the depredations of rats cause immense loss, both directly in the destruction and contamination of foodstuffs and material, and indirectly as agents and carriers of disease. It is, therefore, of the utmost importance that systematic action should be taken by all local authorities responsible for the administration of the Act, by all occupiers of land and buildings, and particularly by those who control large farms, estates, factories, industrial premises, etc., to destroy these pests.

A number of suggestions for concerted action and methods of procedure, specially suitable for application under various conditions, are contained in the Ministry's circular letter. In order to assist in the campaign, the Ministry has offered to lend to local authorities copies of its cinematograph film, entitled "The Rat Menace," some copies of which have been revised in order to make the film more suitable for exhibition in rural areas. A set of lantern slides, together with a suitable accompanying lecture, can also be borrowed for this purpose. Copies of a pamphlet, giving the names of firms who undertake to supply apparatus and poisons for destroying rats, have been supplied to local authorities. This pamphlet, which also contains some simple suggestions for rat destruction, is suitable for distribution to the general public, and the Ministry has suggested to authorities that copies of the pamphlet should be made for that purpose. Useful suggestions and advice are also contained in the Ministry's Advisory Leaflet, No. 49, on the destruction of rats, single copies of which may be obtained gratis and post free on application to the Ministry, whilst additional copies can be obtained at the rate of 1*d.* each, or 9*d.* per dozen, postage extra, through

any bookseller, or direct from any Sale Office of His Majesty's Stationery Office.

A more comprehensive publication, *Rats and How to Exterminate Them* (Bulletin No. 30), may also be obtained through any bookseller or direct from His Majesty's Stationery Office at the price of 6*d.* (7*d.* post free). This publication of 22 pages contains several interesting illustrations.

The Ministry is always prepared to give assistance and advice in any cases of rat infestation that present features of unusual difficulty.

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Demonstration of Harvester-Threshers

THE demonstration of harvester-threshers, of which an intimation appeared in the August issue of this JOURNAL (p. 461), was duly carried out from August 27-29 on the Elton Hall Estate, Elton, near Peterborough, by kind permission of Colonel Douglas James Proby. The land is a heavy clay, with some fairly stiff gradients, and it is, therefore, interesting to be able to record that, notwithstanding a heavy rainfall immediately preceding the demonstration, all the machines concerned worked satisfactorily and without stoppages of a serious character. Indeed, in one field of badly-laid oats, the harvester-thresher was used with good effect after an attempt to harvest with binders had been abandoned.

The greater part of the work done was what is known as "straight combining"—the corn being cut, threshed and bagged in one operation, with a rate of progress of about two acres per hour. Some work was, however, carried out with windrowing and pick-up attachments, the corn being cut and then left in windrows which, after a suitable interval for the drying of the grain, were picked up and threshed by the machine. The relative advantages of the two methods of using the machines continue to be the subject of discussion.

During the demonstrations, the grain, as it came from the machines, was loaded on to lorries and taken direct from the field to the drying apparatus at the mill. One parcel was, however, taken by the purchaser without being artificially dried.

The demonstration attracted a greater number of spectators than has been seen at any previous demonstration of the machines in this country, visitors coming from places as far apart as Haddingtonshire and the south-western counties

of England. A growing interest appears to be taken in the harvester-thresher, and next year's harvest should find many more machines in commercial use than the seven or eight which, according to the Ministry's information, have been in use this year.

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Agricultural Machinery Testing Committee

THE following Certificates and Reports issued by the Ministry in respect of performances, under test, of agricultural machines have been printed and issued in pamphlet form :—

(*a*) No. 25. A "Bamlett" Two-horse No. 9 Double-drive Mowing Machine, manufactured by Messrs. A. C. Bamlett & Co., Ltd., Thirsk, Yorkshire.

(*b*) No. 27. The "Vickers" Agricultural Tractor (Paraffin), manufactured by Messrs. Vickers (Crayford), Ltd., Crayford, Kent.

The prices of the pamphlets are : No. 25, 2*d*. net ; and No. 27, 3*d*. net ; post free, 2½*d*. and 3½*d*., respectively. Copies can be obtained through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

* * * * * *

Soil and Fruit Surveys

THE second of a series of surveys of the various types of fruit soils that occur in different areas of this country, and of the fruit growing on such soils, has been issued as one of the Ministry's Bulletins.*

A question on which the farming community frequently asks advice is whether certain land is suitable for fruit-growing. In order to obtain the information necessary to supply an answer to this question, the Ministry's Conference of Advisory Chemists recommended in 1922 that attempts to correlate fruit culture with soil types should be made in East Anglia and in the West Midland counties. It was proposed that the surveys of soils and fruit in the two areas should be made by the Horticultural Research Stations at Cambridge and Bristol Universities respectively. These proposals were approved, and grants from the Development Fund were given for the work. Three surveys have so far been completed—two in the East Anglian area and one in the West Midland area. A second survey in the latter area

* Bulletin No. 15, *Fruit-Growing Areas on the Old Red Sandstone in the West Midlands*. Price 3*s*. 0*d*. (3*s*. 3*d*. post free), direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, or through any bookseller.

is now proceeding. A fifth survey of a south-eastern area, carried out jointly by the South-Eastern Agricultural College (Wye) and the East Malling Research Station, has also been started.

The whole of this fruit soils survey work is being supervised by a special committee—the Fruit Soils Survey Committee—of the Advisory Chemists Conference.

The first report (Research Monograph No. 6)* dealt with the results of the first East Anglian survey—that of the Wisbech district—and was issued in September, 1929. The present publication contains an account of the work and results of the first West Midland survey—that of the Bromyard and Ross areas.

* * * * * *

Rothamsted Annual Report, 1930

THE issue of the Rothamsted Experimental Station's annual report is an event of some importance in the world of agricultural science and practice. The report deals with investigations into problems of crop production and utilization, and with the wide field of the growth of the plant, in health and disease—its nutrition, its reaction to soil and climatic conditions, and the different combinations of the varying factors that combine to affect its growth.

This latest report† is a record of the experimental work carried out during the past year in the Station's laboratories and on its farms at Rothamsted and Woburn, as well as of trials it has been possible to arrange on privately-worked farms. As an example of field work in connexion with fertilizers, a potato experiment of 1930 may be taken, in which the point under investigation was the effect of the "balance" of the nutrients on the yield and composition of the crop. This has been found to be a fruitful form of experiment, because, while the necessity for the nutrients is well known, little information has been available hitherto regarding the proportions required to give the best results. Similar experiments have been carried out with barley, sugar-beet, forage mixtures and grass land. Two new rotation experiments are described, one intended to test various alternative methods of returning to the soil the straw grown on the holding; the

* Price 3*s*. 6*d*. (3*s*. 8*d*. post free), direct from H.M. Stationery Office or through any bookseller.

† *Rothamsted Experimental Station Annual Report*, 1930. Pp. 172. Obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts. Price 2*s*. 6*d*.

other designed to demonstrate the effects of a series of doses of the common nutrients on six different crops at the two farms.

Work in the field by no means exhausts the activities of the Station. Much of the Report deals with the object and results of the varied laboratory investigations on plant nutrition and plant disease. Many of these are highly technical, and are at present of purely scientific interest; but, nevertheless, such work is necessary for the future solution of technical problems. A few of the lines of work that have direct contact with practice may be mentioned. The results of scientific study of the nodule bacteria of the lucerne plant have now been carried into practice, and artificial inoculation of lucerne seed, according to a technique devised at Rothamsted, is commonly carried out by growers of this crop. Over 4,000 acres of lucerne were sown down with inoculated seed during the period covered by the report.

A further application of microbiological research is to be found in the artificial rotting of straw and other vegetable wastes by the controlled activities of fungi and bacteria. This is widely-used in the preparation of organic manures at home and in the colonies, and the product is being exhaustively tested in the field experiments. The course of decomposition is being further studied.

In the physics department, a systematic study of soil cultivation is being made with the object of placing this costly item in the farmer's expenditure on a scientific basis. A beginning has been made with a detailed examination of the effects of rotary cultivation. The physical action of the treading of sheep, so important on light land farms, is also being investigated. The most extensive experiment in the department of plant pathology is concerned with the so-called virus diseases, a problem of considerable complexity demanding systematic research from many points of view.

The report contains abstracts of the more important scientific papers published during the year, as well as a list of technical articles of a practical type. It should be in the hands of all who are interested in the problems of plant nutrition and plant diseases.

* * * * * *

DISTINCTIVE FEATURES OF PIG-FARMING IN SCANDINAVIA*

W. A. STEWART, M.A., B.Sc. (Agric.),
Principal, Moulton Farm Institute, Northampton.

THE main distinctive features of pig-keeping in Scandinavia may be grouped under the headings of housing, breeding, feeding and marketing.

Housing.—It may be observed at the outset that Scandinavian housing of pigs is characterized by its high general standard. Special attention is paid to warmth, light, ventilation and cleanliness. Constructional details are such that it is possible to maintain a high level of hygienic conditions, and this, no doubt, explains the relatively low incidence of disease. In addition, it is customary on most farms to provide a small isolation hospital of a type that can be easily disinfected. Sick or ailing pigs are immediately removed to "hospital," and in this way the spread of infectious or contagious disease is, to a considerable extent, controlled.

Investigations carried out in Denmark have shown that there is a substantial saving of food in feeding for bacon under up-to-date and favourable conditions of housing compared with older and less comfortable conditions. The figures obtained from a series of trials are given below.

Food units required per 1 *lb. of live-weight increase.*

Modern houses	*Old-fashioned houses*
lb.	*lb.*
3·77	4·37
3·78	4·35
3·88	4·50
4·13	4·65
3·93	4·63
Average 3·90	4·50
Ratio 100	115

From inquiries that have reached the Ministry recently, it appears that considerable interest is felt in the buildings that up-to-date pig-breeders in Sweden and Denmark are constructing to house their stock. Such buildings are very much more complex than is usual in this country, and presumably show their owners sufficient advantage to render the somewhat complicated provisions worth while.

* The plans accompanying this article, and the notes explaining them, have been prepared by Capt. Edwin Gunn, A.R.I.B.A., one of the Ministry's Superintending Architects, in consultation with Mr. W. A. Stewart.

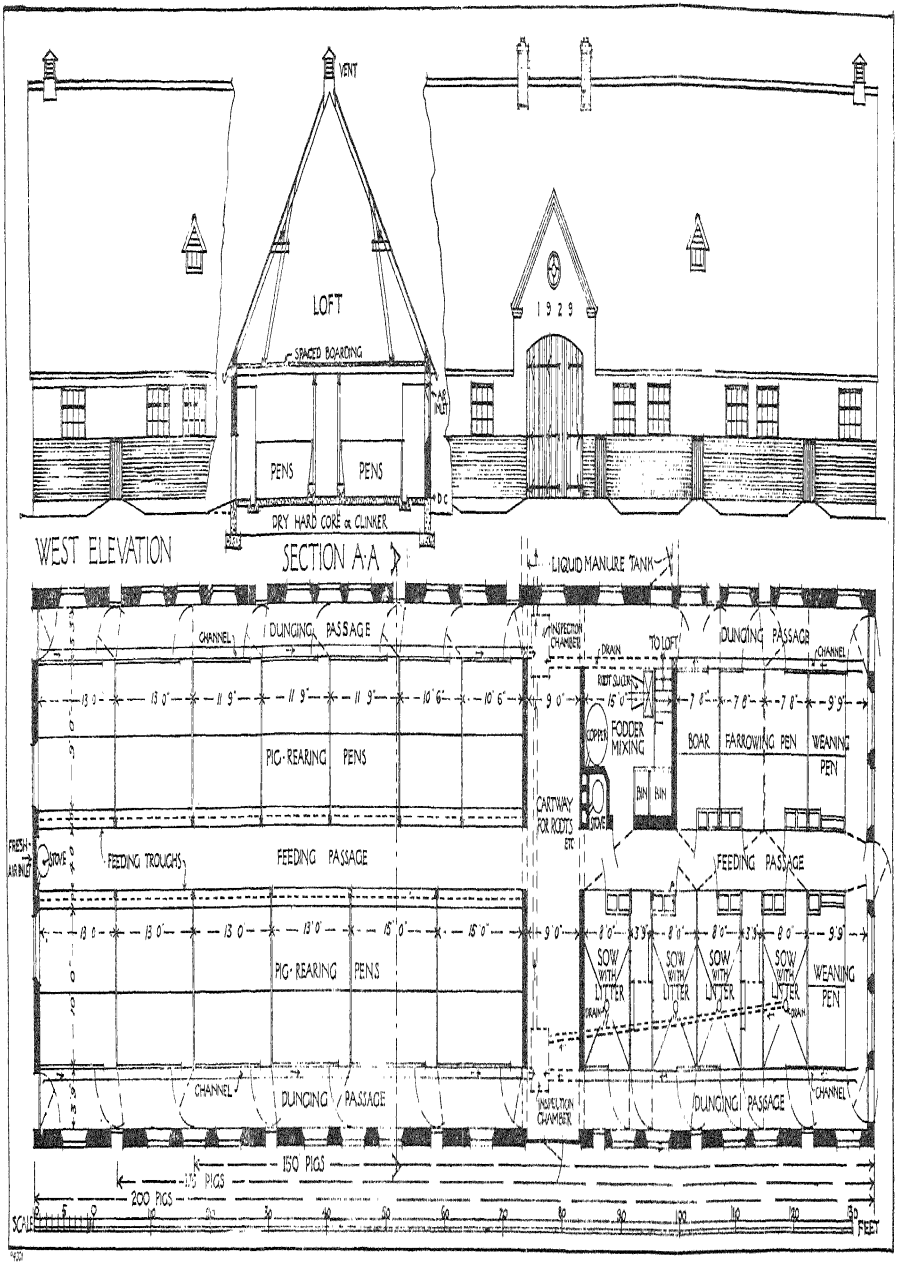


FIG. 1.—Swedish type of pighouse. (For detail drawing see pages 686 and 687.)

To face page 680.

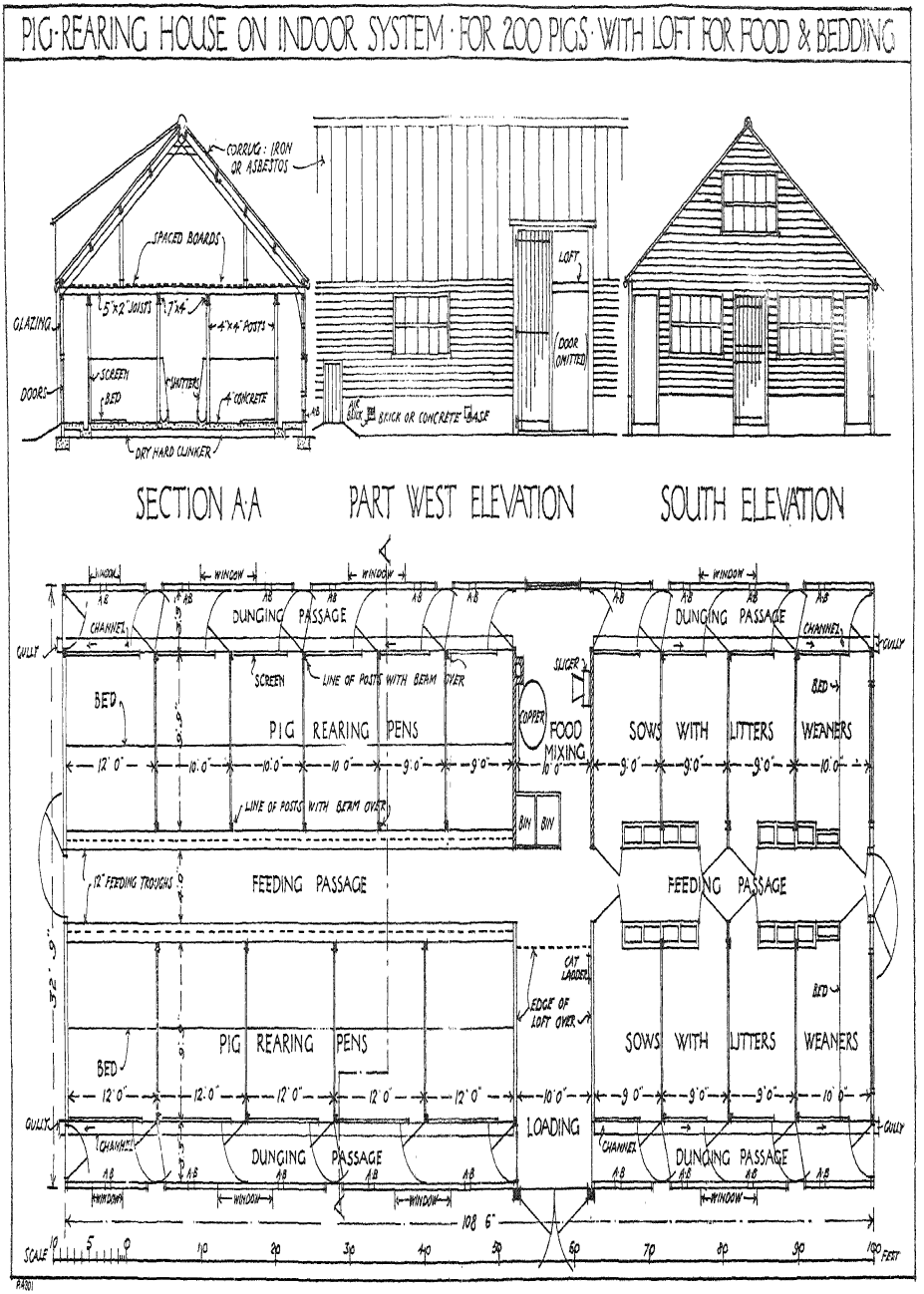


Fig. 6.—Simplified form of Swedish pighouse suitable for English climatic conditions.

To appreciate the theory upon which the designs are based, it is necessary to recognize that three choices are open to the breeder who desires his young pigs to make that rapid and even growth which is essential to good results. Bodily warmth (the essential condition) may be maintained by ample feeding, by admission of sunlight in abundance, or by artificial conservation of heat. The American type of saw-tooth-roofed "hoghouse" aims at achieving its object by utilizing sunlight but, in these northern climes, bright days are insufficiently frequent during the greater part of most years to ensure this advantage; the choice is therefore between food and external comfort. Scandinavian opinion seems to have decided that it is "cheaper to heat with coal rather than with corn," and the type of house shown in the accompanying illustration is based on this conclusion (Fig. 1).

In considering the details of this design, it should be borne in mind that climatic conditions of much greater severity than are usual in this country have to be met. It is apparent from the cross section, and from other details of plan and construction, that steps to guard against severe frosts have been prominently under view when such provisions as the deep foundations, land-drain encircling footings, thick bed of dry ashes beneath floor, internal drainage and insulation of loft floor by clay covering were incorporated. The main external walls also are constructed 16 in. thick, and consist of inner and outer skins each of $4\frac{1}{2}$ in. brickwork with a $6\frac{3}{4}$ in. cavity not left open but filled with dry ashes, a structure that is claimed to have greater insulating value than the more usual open-cavity walling, without being subject to the results of capillarity, which causes ordinary solid walls to convey dampness from outer to inner faces. To render the air inlet and extract flues more intelligible, the insulating cavity has been shown only on the end of the plan at which the stove is placed, but the remaining walls in the intervening spaces between flues and openings are similarly constructed.

It will be seen from the plan that the building consists of a central feeding passage having on one side a range of 10 pens for sows with litters, each pen approximately 13 ft. by 8 ft., and between each pair of which a narrow pen 3 ft. 3 in. wide is formed; this is designed for the tending of young pigs. On the opposite side of the feeding passage lie the rearing pens for weaned pigs, each pen 10 ft. by 10 ft. with two special pens at the stove end, the larger being a farrowing

pen and the smaller for a waiting sow. Extending over the whole area is a loft, used for the storage of food and bedding, but mainly intended as an insulator to preserve the temperature of the pighouse beneath. At one end of the house is a space containing a closed stove, while at the opposite end (not shown) is a mixing house and space for roots.

In working out this relatively simple arrangement, a high degree of ingenuity is shown (Fig. 2, pages 696 and 697). By forming each cross division between pens partly as a swing door 3 ft. 3 in. wide against each external wall, what is in effect a cleaning passage can be formed at will from end to end along each side of the building. Further, these swing doors are utilized as what may be termed " pig valves " in conjunction with the external doors to the open-air runs, each door having four positions, viz. : (1) In position as part of the pen division—marked " A " and " E " on plan ; (2) inclined, to admit entry or egress to right-hand pen—position " B " on plan ; (3) inclined, with similar effect for left-hand pen—position " C " on plan ; (4) folded back parallel with wall to open up cleaning way—" D " on plan ; position " D," where shown, relating to rearing pens, also serves, in combination with the screen to the pig-bed, to confine occupants to a reduced pen while the passage is in being. In use it is found that dunging and staling are practically restricted to the " cleaning passage " area in both sets of pens, preserving the rest of the area in relatively clean condition.

The ventilation system probably requires some explanation. It is based on the admission of fresh air near ceiling level by cranked flues in the thickness of walls, the actual inlets being formed usually beneath the door heads as shown on cross section. This cooler, heavier air tends to descend to the floor by gravity, so pushing the foul air out through continuous ducts, arranged (also in the thickness of walls) just above floor level, by a series of perforations—practically a continuous course of terra cotta airbricks—in this position. These horizontal ducts communicate with vertical flues in the walls, and thence by horizontal pipe-ducts between the floor joists to central foul-air shafts through the loft leading to louvred ventilators on the roof ridge. The pipe-ducts from opposite sides unite in one upcast shaft, with a midfeather or baffle to divert the converging air currents upward ; and it is suggested that warm air from the stove may be introduced here to induce up-current. The stove is in the nature of an emergency provision for periods of severe cold. As the loft

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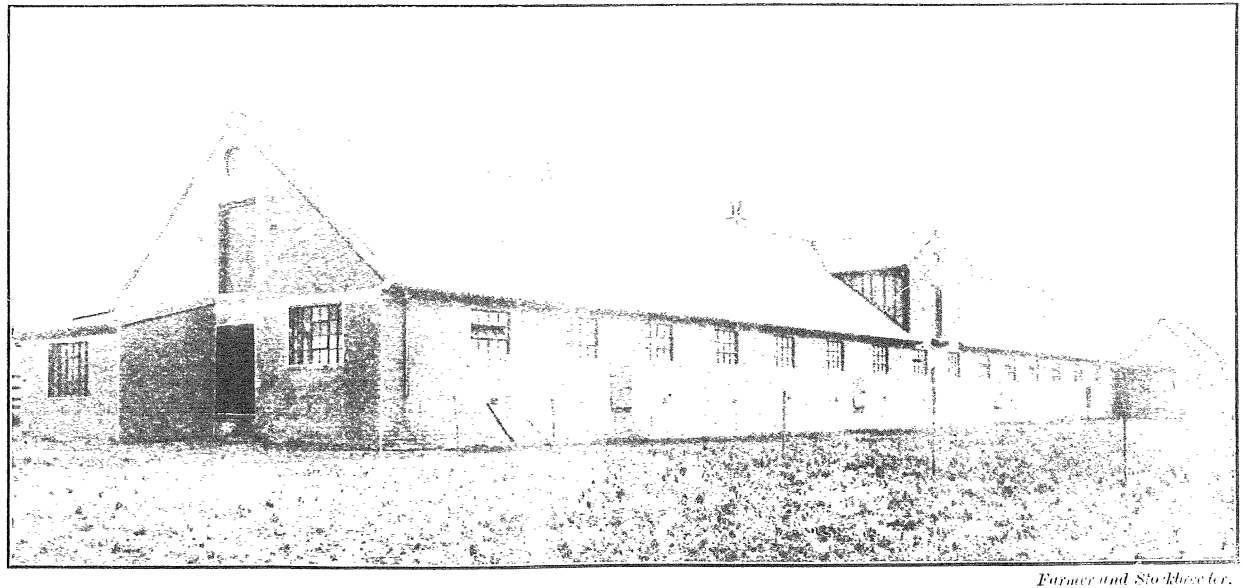
space is effectively sealed by the clay-pugging over the halved firpole joists, separate fresh-air inlets are introduced to the loft at the eaves in order that rot may not be produced in the timbering by lack of ventilation in conjunction with internal condensation of moisture, which must occur on occasion.

The flooring materials are in the main concrete (treated with a hardening solution) or asphalt, but the feeding-passage is laid with adamantine clinkers and the beds in fattening pens with cork-asphalt bricks. The floors in the breeding pens are dished to the central drain outlet; this form, it is stated, prevents a heavy sow from bearing her weight against the pen walls, but farrowing rails of iron tubing are also provided (not shown). The pen divisions are formed of squared boarding with angle and channel-iron supports bedded in the concrete, but also incorporate the posts necessary to carry two lines of beams supporting the cross joists of the loft floor, these also tying the roof. The feeding troughs are of the ordinary type, with a swing shutter that can be bolted in two positions so as to render the troughs accessible from passage or pen at will; but it is noteworthy that the hanging rail for the shutters, which occupies the correct position centrally above the troughs, terminates the pen divisions. These rake from that point, thus giving increased effective width to the feeding-passage.

It is advocated that these houses should always be built with their gable-ends facing due north and south, so that the long walls may receive morning and afternoon sunlight, which from the lower altitudes will penetrate far into the building. In Sweden the windows are not principally relied on for inlet ventilation, and owing to the rigorous climate are often doubled-glazed, with careful provision for the escape of internal condensation water. It is recommended that glazing should be of a type translucent to ultra-violet rays. Delicate weaners should be placed in the pens at the southern end (Fig. 1), where the maximum sunlight is enjoyed. Separate courts are not provided for each pen, but a series of paved runs of moderate extent with, if possible, permanent grass pasture plots in addition, for general use, are advocated.

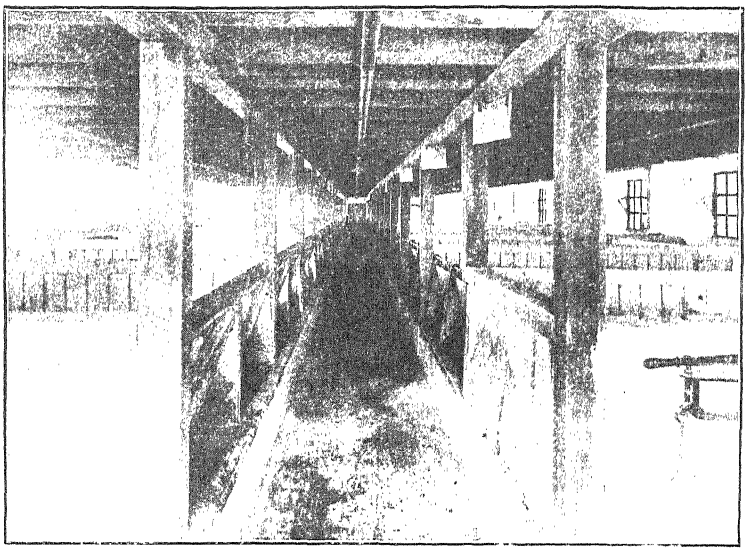
For the less rigorous climate of England some of the Swedish provisions may be thought dispensable. The essentials appear to be: (1) the plan arrangement incorporating the central feeding-passage and the "screen-and-door" adaptable dunging-passages; (2) the overall loft for insulation and storage;

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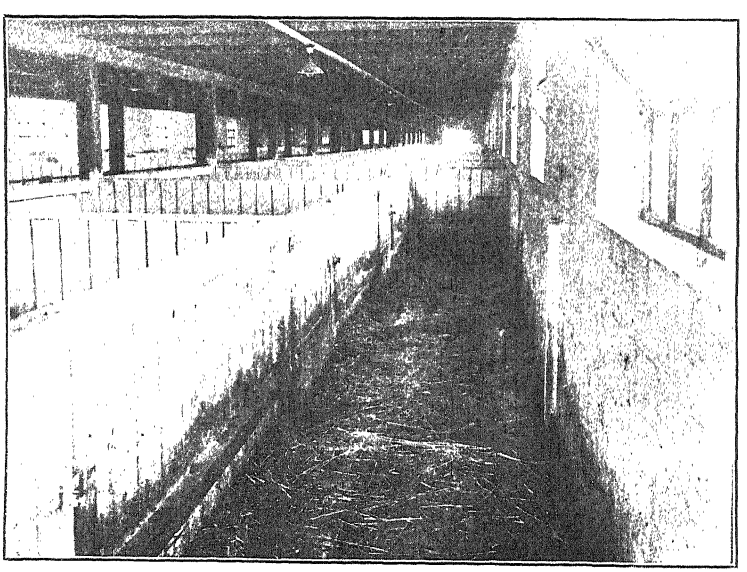
Farmer and Stockbreeder.

FIG. 3.—All-indoors fattening house of Swedish type, recently erected on Messrs. Marsh & Baxter's experimental farm at Kinver, near Stourbridge.



Farmer and Stockbreeder.

FIG. 4.—Swedish type fattening house at Kinver, near Stourbridge. View down centre gangway. Note that troughs occupy the whole front of the pens. Black board above each pen for recording weights, etc.



Farmer and Stockbreeder.

FIG. 5.—Swedish type fattening house at Kinver, near Stourbridge. View from south-east corner, showing pigs shut inside pens, and manure passage ready for cleaning.

(3) the interposition of an under-floor layer of some hard material of open texture interrupting capillarity so as to secure a dry and relatively warm floor under all conditions; and (4) the provision of ample light and ventilation. These requirements would be met by windows aggregating up to one-sixth or one-tenth of the wall space, which should be placed with their heads as close up to the roof as possible. Inlet ventilation would be sufficiently provided if the upper half of each window were hung to fall inwards between hopper cheeks, similarly to the usual cowhouse window, the open portion serving to deflect incoming air upwards along the loft ceiling whence it must fall by its own weight. Outlet ventilation may be provided by a series of airbricks in side walls just above floor level (care being taken that the bricks are placed opposite the screens and not the openings in the screen fence), and by laying the boarding of the loft floor with 1 in. spaces between each board, the loft being ventilated by a series of ridge ventilators. If the loft floor is strawed over when it is desired to retard the escape of warm air, too rapid air-change can be prevented. This method of ventilation, which is less complicated than that shown on the drawing (Fig. 2), has also been largely used in Scandinavia.

Photographs (Figs. 3, 4, and 5) of an "all-indoor" fattening shed on Swedish lines built for Messrs. Marsh & Baxter on Dunsley Hall Farm, Kinver, near Stourbridge, show the arrangement of the cleaning passage, and the ample lighting. In this building, fattening-pens only are included, so that the internal arrangements are much simpler than in the Swedish example illustrated, no provision being made for outdoor runs accessible from each individual pen.

Fig. 6 illustrates a design for an indoor rearing shed in which the arrangements generally are those of the Swedish examples, but the dimensions and construction are reduced to the minimum in size and cost. It is important that the width of dunging-passages should be so adjusted to that of the pen doors that, when these are secured across the passage, pigs can be diverted into any pen. The rearing-pens are graded in size from 9 ft. by 9 ft. 9 in. up to 12 ft. by 9 ft. 9 in. exclusive of the dunging-passage, which is normally open to the pen; farrowing-pens are of a uniform size, 9 ft. by 9 ft. 9 in.; and the two south pens for weaners are 10 ft. by 9 ft. 9 in. each, exclusive of dunging-space.

The loft extending over the whole building (except loading dock) is designed chiefly as an insulating layer and to aid

ventilation. The latter is by inlet through bottom-hung windows, and outlet through space-boarded loft floor, the loft itself having continuous air circulation by the corrugations of roof sheeting at eaves and ridge.

The construction embodies concrete flooring laid upon 4 in. of coarse, dry clinker or brick rubbish; a base wall at least 18 in. high above internal floor level, or preferably carried as high as window-sill level on external walls; weather-boarded timber framing above; and a roof of corrugated iron or asbestos cement sheets laid on purlins at about 4 ft. spacing, the purlins resting on coupled rafters tied by the cross joists of loft flooring and strutted intermediately off a timber sill laid on the joists. The spacing of the coupled rafters (adjusted to suit variation in pen sizes) will be between 8 ft. and 9 ft. The internal walls surrounding food-mixing room should be carried out in 4½ in. brickwork up to loft-floor level, thickened to 9 in. on the side adjoining boiling copper up to 4 ft. high. Separate wooden pig-beds are intended for the house as drawn, but the design is equally adapted for asphalt or cork-brick beds. As illustrated, the cubical contents of the building are about 46,000 ft. and the cost should be about £900.

Danish Breeding Methods.—*Breeding Centres.*—In the "eighties" of the last century, the Danes recognized that the English market for bacon of the "Wiltshire" class was the best outlet for their pigs. For this market, the native Landrace had neither the correct conformation nor the right sort of carcass, and the Danes were obliged to set about improving the native breed in the required direction. Meanwhile, it was found that the British Large White crossed with the Landrace produced, in the first cross, a carcass better suited for bacon curing. To maintain a reliable supply of pure-bred animals of both breeds, and also to encourage progressive improvement, "State Supported Breeding Centres" were established in 1895. Until 1912, the State was contributing some £2,250 annually towards the upkeep of these centres, but in that year the National Federation of Co-operative Bacon Factories took over the greater part of the responsibility of financing the scheme, and in Denmark there are now some 200 "State Recognized" Breeding Centres. Under certain conditions, a Centre is entitled to a premium. In 1929, 4,311 boars and 5,842 sows or gilts were sold from the Danish breeding centres.

The following are some of the conditions to which a breeding centre is required to conform:—

(1) It must consist of at least one selected boar and three selected sows of either pure Danish Landrace or pure Large White breed.

(2) It must be under the permanent inspection of a local selection committee consisting of the Livestock Officer for the district and two members representing the National Federation of Co-operative Bacon Factories. When pigs are inspected for recognition, attention is paid to the following points :—

(*a*) Conformation.
(*b*) Fecundity.
(*c*) Thriftiness as shown by food consumed by offspring at the testing station.
(*d*) Quality of bacon as determined at the testing station.

(3) The owner of the centre is allowed to sell as breeding animals only the progeny of boars and sows that are selected by the above committee.

(4) The centre is inspected three times yearly by a veterinary surgeon. If contagious disease should occur, the sale of breeding pigs is stopped until the centre is free from contagion. All pigs on a breeding centre are subjected to the tuberculin test once a year.

(5) The centre must send pigs to the testing station—an entry consisting of four pigs (two males and two females) from any one litter.

Fecundity Records.—A private register is kept at each breeding centre in which particulars of pedigree, services, farrowings, number of pigs born in a litter, number of pigs weaned in a litter, etc., are recorded. These private registers are under the supervision of the Livestock Officer.

Pig-Testing Stations.—A second series of records is kept to determine production capacity of the offspring. These consist of the reports from the pig-testing stations, which are, in many ways, closely analogous to our egg-laying trials. Four pigs from a litter are sent to a testing station and tests are carried out to supply information on the following points.

(1) Economy of food consumption.
(2) Proportion of carcass to live weight.
(3) Proportion of cured bacon to carcass.
(4) Proportion of the best cuts in the bacon sides.
(5) Quality of flesh and fat.

Each pen is given as much food as it will clear up, all the pigs are fed alike and weighed every 14 days, and are sent to the bacon factory when they are round about 200 lb. live weight. The carcasses of the pigs are followed up after they go to the bacon factory, so that the required information is furnished, partly by the testing station itself and partly by the bacon-factory management, working in collaboration with the Director of the testing station.

Selection of Pigs for Breeding Centres.—It will thus be seen that, in selecting pigs, the Livestock Officer, acting in conjunction with the two representatives appointed by the

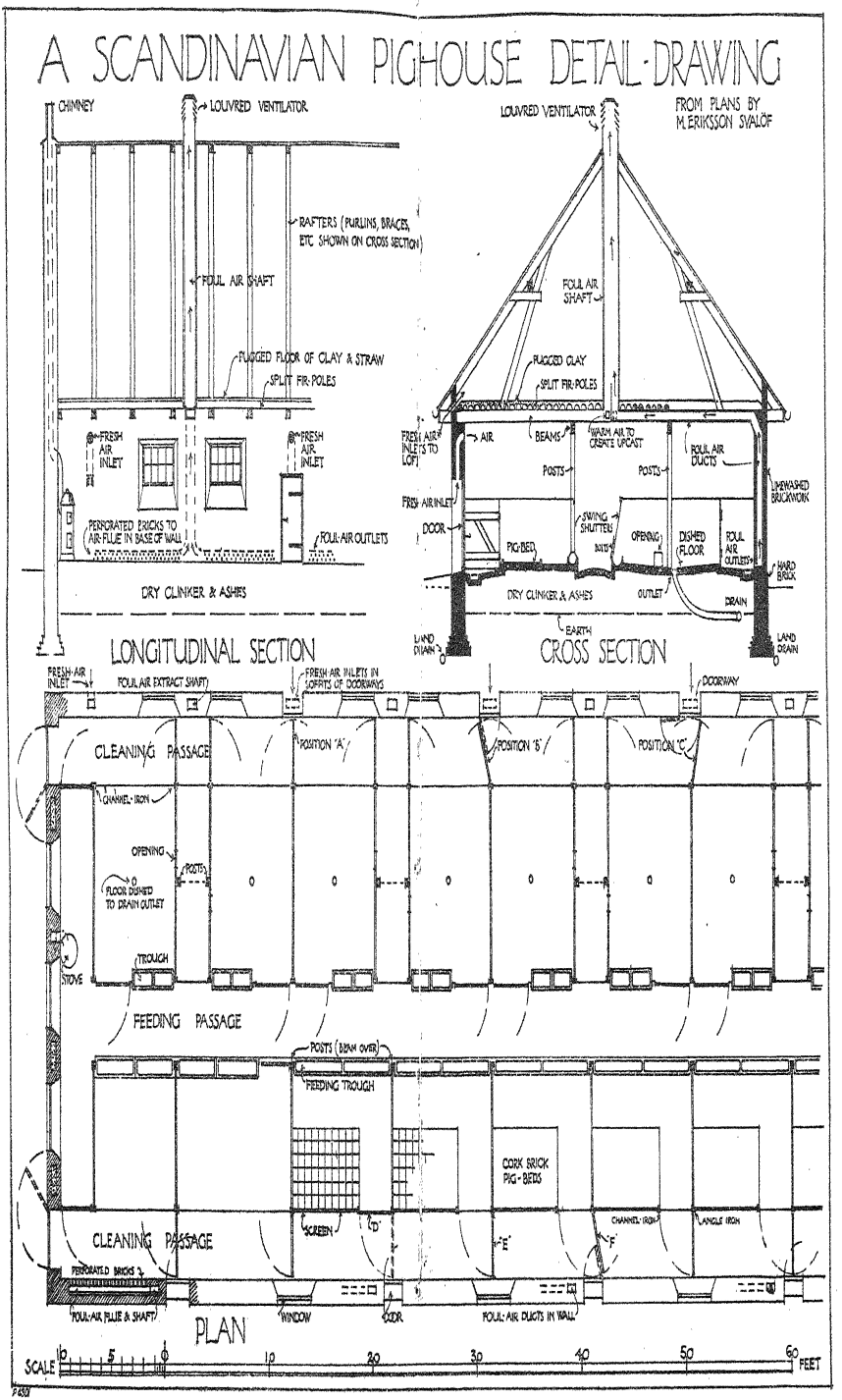


FIG. 2.—Details of Swedish type of pig-house shown in Fig. 1.

Federation of Co-operative Bacon Factories, takes into consideration, not only the external conformation or appearance of pigs, but also the records of fecundity and breeding qualities obtained from the private herd registers, and the records of thriftiness, suitability of carcass, etc., obtained from the testing station.

National Herd Book.—The National Herd Book is edited by the Chief Livestock Officer, by whom the annual selection of animals for inclusion in the herd book is made. In making his selection, the Livestock Officer takes into account the records contained in the private registers and the reports of testing stations, as well as the conformation and appearance of pigs themselves, after having made his personal observation of the pigs at State shows and elsewhere. The herd book contains, in addition to a record of ancestry, references to testing station reports and supplementary information relating to fecundity, prizes won and so on. Sows are not usually entered in the National Herd Book until they have had one or two litters.

Sales.—Pigs from the breeding centres may be sold privately or by auction sale: the Chief Livestock Officer, who has visited this country, favours auction sales of breeding pigs.

Swedish Breeding Methods.—*Breeding Stations.*—Through the efforts of Agricultural Societies, Bacon Factories Associations and prominent breeders, and fostered by the State, four breeding stations for Large Whites and two for Landrace pigs are maintained in Sweden. This number seems small in comparison with the large number of stations in Denmark, but it should be explained that Sweden exports to England only about one-fifteenth of the quantity of bacon that is sent to this country by Denmark; and that the Large White stations include the large herd at Svalof, the property of the Bondesson Land Co., which consists of upwards of 60 breeding sows. The Svalof herd has had a very important influence on the improvement of Swedish pigs.

Sweden is now concentrating on the Large White. The Swedish authorities state that they have found the Large White superior to all other breeds, both for early maturity and for the production of first-class bacon.

The conditions governing the maintenance of breeding stations in Sweden are substantially similar to those in Denmark. Breeding animals on a station must be entered in the herd book, but before admission to this herd book, all

pigs have to pass inspection by an official of the Royal Board of Agriculture, acting alone or in conjunction with members of an Awards Committee. All animals sold from a breeding station have to pass inspection by the local Livestock Officer for the Province.

Scale of Points used in Judging.—The following is the scale of points drawn up by the Board of Agriculture for the judging of boars for admission to the herd book and for awards at shows :—

Breeding	*Max. points*	*External characteristics*	*Max. points*
(1) Sire's breeding value	10	(5) Head and neck ..	5
(2) Dam's yield in weight and average number of pigs	10	(6) Shoulders	5
		(7) Chest ..	5
		(8) Back and loins ..	5
(3) Sire's dam's and dam's dam's yield in weight and average number of pigs ..	5	(9) Sides	10
		(10) Hind-quarters ..	5
		(11) Hams	5
		(12) Constitution (bone, skin and teats) ..	5
(4) Other points ..	10	(13) Type	5
	35	(14) Size & development	5
		(15) General impression	10
			65

Total 100 points.

Full instructions are issued as to how points are calculated under the headings 1, 2, 3 and 4. Item 1 refers to previous awards made in connexion with inspections for entry in the herd book, and to those made at State-subsidized shows, etc. ; items 2 and 3 refer to records obtained under the recording scheme ; item 4 refers to testing-station results.

For a first-class award at least 80 points must be obtained.
„ second „ „ „ 65 „ „ „
„ third „ „ „ 55 „ „ „

Boar Societies.—Grants of about £3 15s., £3 and £2 5s. are made to boar societies in accordance with the class of boar used. Boar societies are much favoured in Sweden and are important in both number and influence.

Testing Stations.—These are conducted on similar lines to those in Denmark.

Recording.—An important development of pig breeding in Sweden is that of official recording, instituted by the Pig Breeders' Society of Malmohus. The object of recording is to ascertain the productive capacity of sows by means of produce records on the farm. These records include information regarding the number of pigs in a litter at birth, the number in and the total weight of the litter at three weeks of age,

their average weight, their variations in weight, their sex, and number of teats.

Three weeks is chosen as the best age at which to weigh, since up to that time the pigs live almost exclusively on their mother's milk, and their weight, therefore, is not only a measure of the quantity of milk of the dam, but also of the capacity of her offspring to thrive. These records constitute a really valuable guide to the productive capacity and maternal qualities of sows.

Recording is carried out by the Recorder of the local milk recording society, who, in Sweden, visits farms every three weeks.

Sales.—Auction sales of breeding stock are favoured ; those held periodically at Svalof and Malmohus are specially important events.

General.—Generally, more attention is paid to commercial qualities, and less to show points and show performance, than in this country. An entry taken from a Swedish sale catalogue is reproduced opposite and shows the kind of information that is provided for intending purchasers. If a comparison is made with an entry taken from an English sale catalogue of pedigree pigs, it will be seen that the details furnished in the Swedish catalogue are likely to be the more useful to intending purchasers of commercial breeding stock. Up till now the "foot-notes" in English catalogues have provided information dealing almost solely with prizes won or fancy prices realized. It is true, however, that movements are now on foot in this country to improve matters in this respect, and such improvement, encouraged by breed societies and auctioneers, may be steadily progressive.

Feeding.—The outstanding feature of Scandinavian feeding methods is the almost universal use of dairy by-products, the network of co-operative creameries providing separated milk or whey for practically all pig-keepers. In Denmark it has been found that the most economical proportion of separated milk to meal in feeding for bacon is $1\frac{1}{2}$: 1, or about 1 gal. of milk to 7 lb. of meal. Separated milk is generally pasteurized at the depot or factory before being returned to the farmer.

Balanced rations of the type recommended in this country are generally employed, but more use is made of home-grown cereals. The "wet" method of feeding is most commonly practised, and the wet food is usually of a thicker consistency

than is common here ; normally the pigs are fed three times daily.

Marketing and Organization.—So much has been written about co-operative marketing in Denmark that it is unnecessary to deal specially with this subject : it will suffice to repeat that the whole system is highly organized and remarkably efficient.

Prices paid to feeders, per kilo of bacon, are based on the wholesale prices in London, feeders receiving a bonus or submitting to a deduction according to the grade of pigs supplied to the factory.

Labour appears to be skilled and highly intelligent ; wages approximate to those paid in this country, but longer hours are worked. In Denmark, 94 per cent. of the agricultural land is owned by the occupiers, and the bulk of the agricultural area is farmed in small farms of from 20 to 70 acres. These farms are well equipped with buildings, implements and machines ; the great majority have telephones, and many have electric light.

SWEDISH SALE ENTRY.

No. 380.

Lot 15.—Farrowed 19-8-29, one from a litter of 12 pigs. Served 13-5-30 by Svalof-Marskalk (R.6498), due to farrow 13-9-30. 12 teats.

Sire—Bjalke av Bjallosa (R. 5555). Dam—Svalof Jairy 4 (R. 3596).

Bjallosa Halva (R. 4594).	Bjalla 33 (R. 2843).	Lajos (R. 3858).	Svalof-Jairy (R. 2105).

Recording-Scheme Results.

	No. of teats	Farrowing No.	No. pigs in litter		Weights at 3 weeks, Kg.			Dates of farrowings
			At birth	At 3 weeks	Total	Average	Variation	
Dam ..	13	1	12	11	62·3	5·7	3·9–6·9	22-8-26
	—	2	10	9	55·8	6·2	4·5–7·2	6-2-27
	—	3	10	9	53·5	5·9	4·2–7·0	21-7-27
	—	Average	10·7	9·7	57·2	5·9		
G.Dam .	14	5–7	16·0	9·7	46·2	4·8		
Sire's .. Dam	13	3–5	10·0	8·0	46·8	5·9		

ENGLISH SALE ENTRY.

Lot 60.—Gilt (0·4), born January 19, 1930 ;

Sire—*Edmonton King David 74th, 64783, by †Bourne King David 145. 52353.

Dam—Westacre Surprise 104th, Vol. 47, by ‡Histon King David 17. 61115.

g.d.—Westacre Surprise 31st, 173612, by Bourne Baron 137. 47429. Served September 13, 1930, by Westacre King David 96. Vol. 47.

* Edmonton King David 74th won 1st at Peterborough, 3rd at Tring and 4th prizes at the R.A.S.E. Show, 1928. He is litter brother to Edmonton Bonetta 18th, that won 1st at the R.A.S.E., Royal Counties and Peterborough Shows, 1928, and to other prize-winners.

† Bourne King David 145th sired many prize-winning animals, including the Breed Cup winners Smithfield Show, 1926, the Supreme Champion pig Smithfield Show, 1928, and the 1st prize gilt R.A.S.E. Show, 1928, etc.

‡ Histon King David 17th won 1st prize at Fakenham, 1928, and was sold for export for 100 gs. He was by the R.A.S.E. Champion boar Bourne King David 36437, and out of Histon Bell 66th, 105964, full sister to Histon Wonder, Champion boar R.A.S.E. and Highland Shows, 1922.

There are also given additional "Show" particulars of Westacre Surprise 31st, Bourne Baron 137th, and Westacre King David 96th.

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THE EMPIRE MARKETING BOARD AND AGRICULTURAL RESEARCH IN ENGLAND AND WALES

IN the Fifth Annual Report of the Empire Marketing Board, covering the year May, 1930, to May, 1931, considerable space is devoted to the grants made by the Board for research and development. Among these are many grants made to institutions in England and Wales and administered by the Ministry on behalf of the Board, and it may not be inopportune to supplement the account of such grants that appeared in the issue of this JOURNAL for July, 1929. The majority of the investigations described therein are still in progress and are yielding interesting and valuable results.

Several new grants or extensions of existing grants have been sanctioned since the appearance of the earlier JOURNAL article.

A.—Schemes already in operation in July, 1929.

B.C.G. Vaccine Investigations.—The investigations into the use of B.C.G. vaccine against tuberculosis (for which a capital grant of £3,000 was made to the Department of Animal Pathology, Cambridge University) have shown that the vaccine has the power, if suitably administered, to raise a calf's resistance to tuberculosis to a very high level. Many calves vaccinated with B.C.G. and then infected with virulent bovine tuberculosis germs have survived for from eight to twenty months, although similarly infected calves that have not received the B.C.G. died within three weeks.

Stored Products Research.—Work on the infestation of stored products by insects and moulds has been continued by the staff of the Biological Field Station of the Imperial College of Science and Technology at Slough, with the valuable co-operation of port authorities and merchants. Consignments of cacao and dried fruits are inspected at the London docks, and samples of West African cocoa arriving at Liverpool have been sent to Slough for examination. The investigation of certain tobacco problems has been undertaken on behalf of the Southern Rhodesian tobacco interests. The determination of the moisture, mould and insect contents of samples of West African cacao landed at Liverpool has yielded interesting results, particularly in the number of fungi and insects affecting the produce.

Virus Diseases of Plants.—The important investigations into the fundamental nature of virus diseases of plants, for which grants are being made to the Rothamsted Experimental Station and the Cheshunt Experimental and Research Station, are still in progress. At Rothamsted, the difference between the reaction to virus infection of winter-grown and summer-grown plants has been traced to the difference in the hours of light. It has also been shown that the virus cannot travel across dead tissue or enter the living cells of the plant from the xylem unless some rupture has occurred. At Cheshunt, the progress and severity of the disease in the living plant has been studied in relation to light of different wave lengths, varying duration and intensity of light, metabolism and inoculation methods. The results obtained indicate definite progress along certain lines both in the evolution of methods of attack and data obtained by those methods.

Breeding of Pedigree Grasses.—At the Welsh Plant Breeding Station, University College of Wales, Aberystwyth, last summer saw the first harvest of certain pedigree strains of grasses that were "grown-on" under contract by farmers in Montgomeryshire in order to obtain sufficient supplies for further testing and for despatch overseas. A good harvest was obtained, consisting chiefly of pedigree strains of cocksfoot and perennial rye-grass; timothy and red fescue were also grown. Good progress has been made in establishing selected pedigree families.

Other investigations still in progress at English and Welsh research institutes that are financed from the Empire Marketing Fund include the study of the factors influencing the storage

qualities of fruits at the Long Ashton Research Station, Bristol University; the rootstock investigations at East Malling Research Station; the work on market garden pests and diseases at Cheshunt; the research in poultry nutrition problems and the physiology of farm animals at the Animal Nutrition Institute, Cambridge University; the study of the problems of poultry meat production and the economics of the dual-purpose fowl at the National Institute of Poultry Husbandry, Harper Adams Agricultural College; and the collection and dissemination of information relating to agricultural economics within the Empire at the Agricultural Economics Research Institute, Oxford University. The investigation into dry rot of swedes and turnips, carried out at Reading University under the direction of the Ministry's Plant Pathological Laboratory, has been brought to a satisfactory conclusion.

B.—Schemes sanctioned since July, 1929.

East Malling Research Station.—One of the most important of the new grants has been made to the East Malling Research Station. The Governing Body accepted the invitation of the Executive Council of the Imperial Agricultural Bureaux to establish the Imperial Bureau of Fruit Production at East Malling, if means could be found to provide accommodation for the increased staff and materials that would be necessary, and to provide also for those sections of the Station's organization upon which further responsibility would fall. A capital grant of £13,200 and maintenance grants of £2,550 in the first year rising to £2,950 in the third year were sanctioned. A scheme has been put into operation for accommodating a limited number of fruit research workers from oversea Empire countries at the Station. Facilities will be provided for post-graduate workers to carry out individual research at the Station for a period of two years.

Department of Animal Pathology, Cambridge University.—A further capital grant of £4,250 has been made to the Department of Animal Pathology, Cambridge University. For some time past, the need for further laboratory accommodation at the field station of the Department has been pressing, and there is every likelihood of an increase in the number of workers from the Empire overseas who desire to make use of the facilities at Cambridge for advanced study and research in veterinary science. The grant from the Empire Marketing Fund represents one-half of the total State grant, the other half being contributed from the Development Fund.

Methods of Soil Analysis.—It has been found that the international method for mechanical analysis of soils is not suitable for all parts of the Empire, and a grant of £430 for one year was made to the University College of North Wales, Bangor, to enable a comparative study of methods of soil analysis to be undertaken. At the request of the Executive Council of the Imperial Agricultural Bureaux, the Board have approved a further grant of £450 to enable the investigation to be continued for a second year. So far the work has proved the contention that the international method is unsuitable for several Empire soils, but indicates that with comparatively small alteration it may be made of use.

Experiments with Rice Grass.—The experiments with Rice Grass (*Spartina townsendii*) as a preventive of erosion, undertaken by the East Anglian Institute of Agriculture, produced such interesting results that the Board agreed to continue their support after the initial period of a year. A further grant of £1,000 to be spread over a period of three years has been approved, for the purpose of investigations to test out the grass in different situations and to determine the best methods of transporting seeds and plants overseas.

Wild Rodents Research.—As a result of the first year's work at the Department of Zoology and Comparative Anatomy, Oxford University, on the fluctuation in numbers of wild rodents, it was found that difficulties arose from the lack of knowledge of the causes regulating the breeding seasons and rate of reproduction of these wild rodents. A further grant of £280 per annum for two years was sanctioned to enable the factors controlling the reproduction and breeding seasons of wild field mice (voles) to be studied. The two investigations have been carried out in close co-operation and have yielded remarkably interesting and clear-cut results. The future of the work is under consideration.

Economic Ornithology.—The Department of Zoology at Oxford is also undertaking a scheme of research in economic ornithology, of which half the cost is met by a grant of £250 per annum for three years from the Empire Marketing Board. The other half is provided by a private benefactor and from the Ministry's funds. While certain foreign countries have given much practical attention to this subject, very little has been done within the Empire. The economic importance of birds to agriculture, as consumers of crops and of insect

and other pests, will be systematically studied, and a number of young observers passing through the University on their way to appointments in the overseas Empire will be given some training in the methods of economic ornithology.

C.—Dairy Research.

Dairy Research.—The work on faults in dairy produce undertaken at the National Institute for Research in Dairying, Reading University, has opened up wider fields, and the Empire Marketing Board commissioned Sir William Dampier, F.R.S., to survey the field of dairy research in England, Scotland and elsewhere, and to indicate for the Board's guidance (*a*) the proper line of division between a specialist dairy research institute and the work of other research institutes in the sphere of nutrition, animal diseases and low temperature research, and (*b*) the extensions contemplated or desirable, and the most important scientific or practical problems to which attention should be directed. A comprehensive report has been submitted by Sir William Dampier.

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SILVER FOX FARMING IN GREAT BRITAIN

E. WITTÉ.

IMPORTS of silver foxes into Great Britain, with the object of breeding for pelt production, have been noted in the Press from time to time during the past decade; and it has been suggested that agriculturists and landowners might find, in silver fox farming, a profitable side-line occupation to add to their other activities. A brief account of the industry, with particulars of some of the more important points connected with it, may, therefore, be of interest.

The Silver Fox.—The silver fox is thought to be a variant of the American Red Fox. Specimens were occasionally caught, many years ago, in the far north of the American continent and, as their skins fetched high prices in the fur market, the animal became an object of immediate interest to trappers. The number of skins, never very great, that reached the market in this way, however, gradually dwindled as years went by; and one or two trappers, of Prince Edward Island, Canada, realizing the scarcity of the animal, began, about 1883, to try and breed them in captivity. As the result of their experiments and the experience gained thereby, an extensive breeding industry has since been developed on the American continent.

The Prince Edward Island breeders wisely adopted a sound system of inspection and registration for pedigrees, and by this means the silver fox was established as a fixed breed with an agreed standard of points. With animals imported from the established Canadian stocks, breeding has now been started in a number of European countries; and in Great Britain, where breeders have also adopted a standard and a system of registration, there are now over 40 silver fox farms.

The main points of the silver fox are as follows. The mature dog fox should be about 45 in. long from the tip of the nose to the tip of the tail, with a weight of about 15 lb., the length and weight of the adult female being slightly under the above figures. The colour of the fur should be blue-black, and the silvering of the guard hairs bright and clear. The brush, about 18 in. long and 5 in. in diameter, should have a cone-shaped tip of white fur. The under fur, of a slaty colour, should be fine, soft and dense. In describing a fox, the silvering is graded in quality as follows: pale or whole-silvered; three-quarter-silvered; half-silvered; quarter-silvered; slightly-silvered; and black. The silvering, on the back from rump to neck, appears on the guard fur, which is from $2\frac{1}{4}$ in. to 3 in. long, to a depth of about $\frac{3}{4}$ in. from the tips. The hair must be of good volume, without matts, and silky in texture. It is of special importance that there shall be no brown or rusty tinges in fur that is prime, *i.e.*, at its best state of development, generally early in the winter season.

The Industry in Great Britain.—Silver foxes were first bred in Great Britain in Ross-shire, Scotland, where a farm, still in operation, was started in 1920 with Canadian imported stock. Since then farms have been started in various places, ranging from Cornwall and Wales in the west, to Kent and Norfolk in the east. Varying in size from 5 to 70 breeding pairs, some of these farms are worked by individual owners, while others, owned by limited liability companies, are operated by resident managers.

The basis of the industry, as already stated, is the production of pelts or skins. This necessarily involves the killing of the animals and, as the number of cubs produced annually by a breeding pair is comparatively small, it will be realized that, if operations are commenced with only one or two pairs, the development of the farm to production point will take a little time. The skins are sold in lots at the regular London Fur Auction sales; and, at those recently concluded, about

60,000 skins—an unusually large number—were offered, many of them coming, of course, from Canada and elsewhere. It is satisfactory to record, however, that, in spite of the large number on hand, all the skins were sold at satisfactory prices. The top price, so far, obtained for a Scottish-produced pelt is £125, while many have been sold at from £40 to £60 each. It is well to note, however, that the average price for a good pelt is from £15 to £35. Prices naturally depend on market conditions as well as on the size and quality of the skins.

There is also a very profitable market in the sale of live stock for foundation purposes, *i.e.*, the stocking of new farms at home and abroad, as well as for the improvement of existing stocks. A breeder may desire to introduce new blood into his stock for general breeding reasons, for the improvement of fur quality or for the correction of the colour grades.

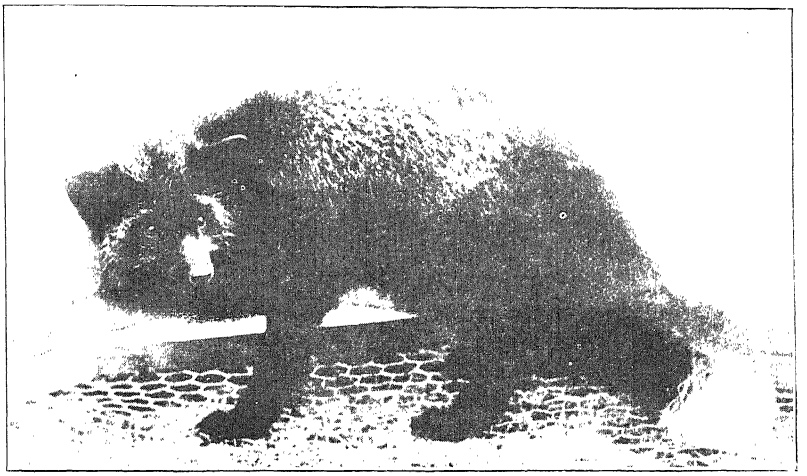
As to prices of live stock, these range, as a rule, from £150 to £250 per pair, with a discount, perhaps, where a number of pairs are taken. At these prices, it is possible to obtain the best-quality silver foxes, British bred and acclimatized, and registered with the Silver Fox Breeders' Association of Great Britain.

Points for a Beginner. —Those who contemplate breeding silver foxes must consider several important points, among which may be mentioned :—

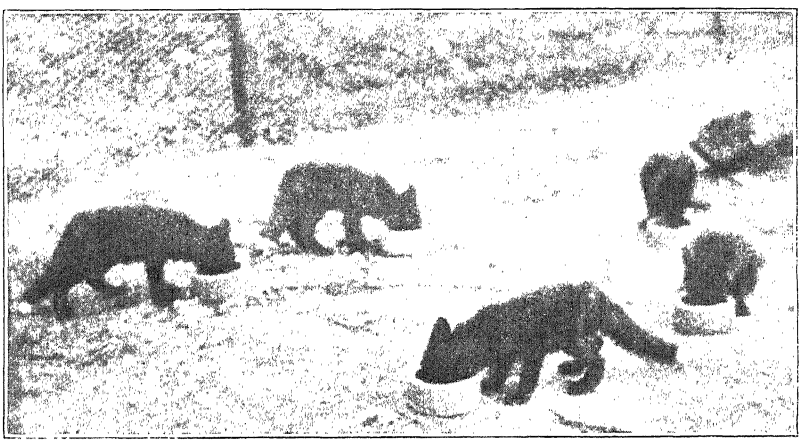
(1) Purchase of the initial or foundation stock.
(2) Situation of the farm and the kind of land suitable.
(3) Erection and cost of pens, guard fences and kennels.
(4) Details of breeding and mating.
(5) Matters relating to operation costs and farm management.

It is only possible here to touch briefly upon these points, but a beginner can obtain more detailed information from the nearest established fox farmers, and he would be well advised to visit a few fox farms to become better acquainted with conditions and procedure.

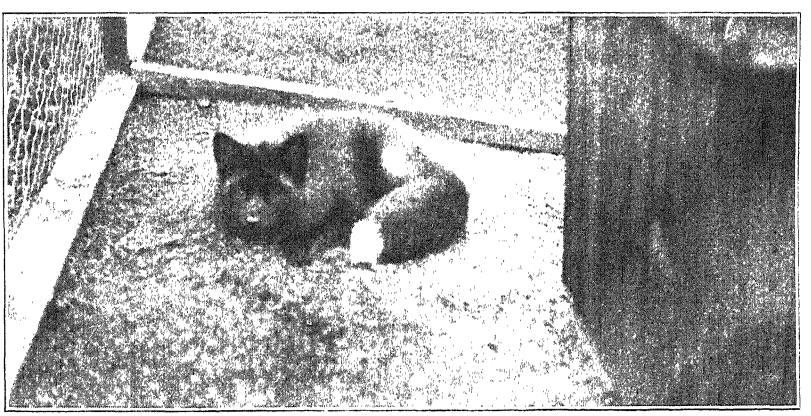
Foundation Stock.—One method sometimes adopted by beginners is to purchase a pair or so of foxes and arrange for them to remain on the vendor's farm for one or two breeding seasons. A boarding or ranching fee, as it is called, is charged for the service ; and, at the end of the period, the foxes so purchased should have produced sufficient progeny to allow the purchaser to start operations on his own account. In two breeding seasons, two pairs may be expected to produce 8 cubs, so that there would be 12 foxes to start a new farm



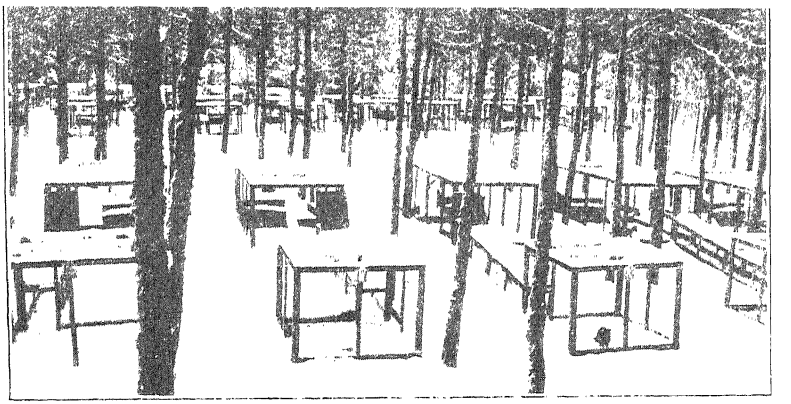
A fine specimen of an adult, male silver fox.



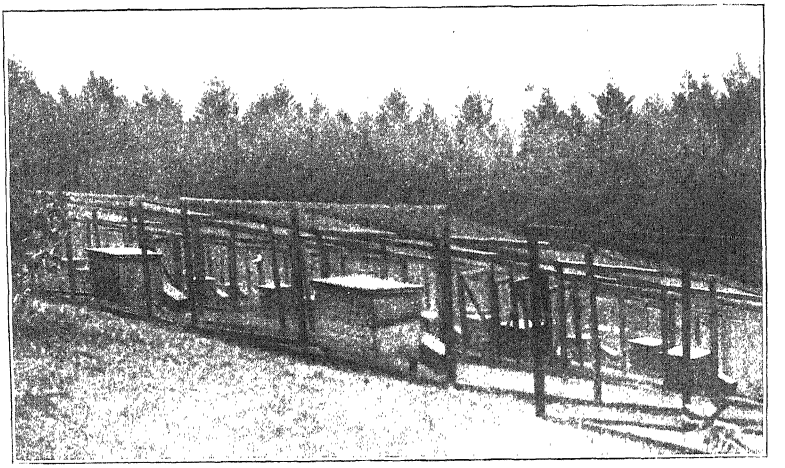
A good litter of silver fox cubs.



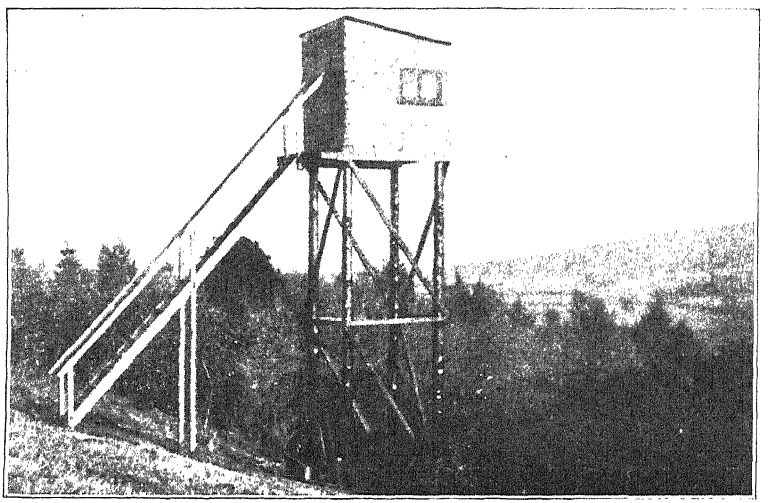
A prize-winning adult, polygamous, male silver fox.



Winter view of breeding pens on a silver fox farm in Aberdeenshire.



Some pens at a silver fox farm in Devonshire.



with. Generally speaking, it is not advisable to start a farm with less than two or three pairs of foxes.

Land and Enclosures.—As to land, half-an-acre enclosure is sufficient for five pairs of foxes, and ground unsuitable for most purposes may well be utilized for the foxes. Slightly wooded land is very suitable. It is essential, however, that the soil should be well drained or of a quick-drying description ; land that is saturated or in a continually damp condition would be detrimental to the stock. The site should be surrounded by a guard fence of wire netting about 8 ft. high, for the double purpose of keeping the foxes in and intruders out. Inside this enclosure are the pens to house the foxes, made in various designs, with a framework of wood or galvanized iron tubing, covered with wire netting. The netting must be carried down well below ground level to prevent the foxes burrowing under and escaping from the pens ; indeed, considering the value of the stock, the provision of netting over the floors as well as the tops of the pens may be advisable. Special, portable pens, with netted floors, are obtainable; these can be taken to pieces, moved and re-erected as desired.

The size of the pens is generally 36 ft. by 18 ft., but individual breeders may prefer smaller or larger ones. Each pen contains a breeding kennel and a smaller one ; the latter is so placed that a section of the pen may be shut off if it is desired to separate the dog fox from the vixen, a proceeding that some breeders consider desirable at certain seasons of the year. Alternatively, smaller pens, 20 ft. by 10 ft., may be provided for this purpose, or for housing cubs as occasion may require, while some breeders also make use of large exercising pens or runs for young foxes, but the benefit of these has been questioned. The cost of constructing pens, etc., depends on labour, supplies and so forth, but, as a rule, £200 should cover the cost of the guard fence, 5 breeding pens, a few cub pens and other small equipment, such as feeding utensils.

Feeding.—Feeding is of paramount importance. Silver foxes are carnivorous and require fresh meat, but cereals, biscuit, brown bread, vegetables, fruit, milk and eggs at whelping time also form part of their diet. Quantities must be carefully regulated and seasonal feeding duly observed. Wild rabbits are given, one average-sized rabbit making five portions. Regularity of meals is essential, and a good plan is to follow a prearranged chart so that a sound, balanced ration is ensured throughout the year. The personal attention

of the owner or keeper is also desirable so that the idiosyncracies of individual foxes as regards food may be noted. The feeding, in fact, is so important that it would pay a prospective fox farmer to spend a short time on an established farm to obtain a thorough knowledge of this side of the work. The costs of feeding obviously depend on local conditions, supplies available, etc., but about £5 per annum per fox may be taken as a fair charge.

Breeding.—Silver foxes breed once a year, and farms, as a rule, are closed to visitors during the breeding period. This covers about five months, from early January until early June, when most of the cubs are weaned. The period of gestation is about 52 days. Litters average from three to seven cubs, four being a good average. Foxes are monogamous, but some breeders have met with considerable success in polygamous mating. This requires experience, and study of the details should be acquired by residence at a farm.

Conclusion.—In conclusion, it can be definitely stated that many breeders show a net profit of 60 to 65 per cent. on invested capital. Four hundred pounds per annum can be earned from five breeding pairs, and a successful breeder can recover his outlay for foundation stock after one year, while a second breeding season should enable him to cover all other expenses and at the same time allow him to increase his breeding stock.

As indicated in the above brief survey it is desirable that the prospective entrant into the industry should have a course of personal study on an established fox farm. By this means he will gain valuable first-hand knowledge of many details that cannot be enlarged upon within the compass of a short article.

As a preliminary, he might very well visit the Annual Exhibition of live Silver Foxes. This year's show will be held at the Agricultural Hall, London, next month (November 4-6), when about 200 foxes, the pick of the animals that Great Britain has to show, will be on view. Only British-bred foxes will be shown, and ten silver cups and trophies will be competed for.

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THE ESTABLISHMENT, MAINTENANCE AND RENOVATION OF LAWNS

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IT is not proposed in the following notes to deal with expensive and elaborate methods of large-scale lawn construction, but rather to offer suggestions that will enable persons, with no special skill or technical knowledge, to establish and maintain an excellent lawn at a reasonable cost, or to renovate already existing swards in poor condition.

Most people appreciate the amenity that a lawn gives to a home. Probably many of them spend fruitless hours attempting to produce an ideal sward, coming to the conclusion, after innumerable failures, that their soil is too poor to grow anything. Yet the desirable lawn grasses grow naturally at high altitudes and often on water-logged soils, where the level of fertility must be very low and where poverty conditions inevitably prevail. Failure cannot, therefore, be attributed to poverty of the soil; more probably it is due to haphazard cultivation before seeding, and to the sowing of seeds more suited to the making of a pasture than a lawn.

Sowing Down a Lawn.—It is now generally agreed that lawns can be fed sufficiently from the top and that expensive deep preparation of the soil before seeding is unnecessary. What is essential, however, is *thorough* cultivation of the top four inches of soil. This top spit should be a medium loam in texture and every effort should be made to produce this, otherwise success is not possible. If the soil is of a heavy, clay type, then it should be incorporated with sand and some form of organic matter, such as leaf mould or farm-yard manure. If, on the other hand, the soil is of a sandy nature, then it can be made to approximate to a loam by applying farm-yard manure together with a certain proportion of heavier soil. In short, whatever the nature of the sub-soil the top spit should be a medium loam in character.

If draining or grading is necessary when constructing the lawn, great care should be taken always to preserve the proper relation of soil to sub-soil. If the changes in grade are more than can be accomplished by the addition of top soil, then the top spit should be removed, the sub-grade modified as required and the top soil returned. When a new house is being built and the grounds laid out, no matter what the nature of the

top soil, it should never be covered with clay or gravel that has been thrown out when digging the foundations for the buildings. Many instances have come to the notice of the writers where good top soil has been covered with sub-soil, levelled down and seeded, the mistake being later forcibly impressed upon the owner by an unsatisfactory and patchy growth of grass, having a tendency to dry out and brown in dry weather.

There are two seasons when it is customary to sow down a lawn, namely, spring and autumn. Undoubtedly the early autumn is preferable and one might almost say essential. Spring sowing has the single advantage that the plants are older and stronger and thus better able to withstand any severe weather that might occur during the ensuing winter months. Against this there is the possibility of a summer drought which may kill off the young seedlings, while spring-sown grasses have also to compete with, and may succumb to, weeds which begin to germinate and thrive during the summer months. The best method is to commence tillage operations in spring or even earlier, but delay sowing until late August or early September. A lawn sown in late summer or early autumn will have become firmly established before the frosts set in, and, by the following spring, the young grass plants are better able to withstand the heavy summer cutting and compete successfully with weeds.

Cultivation in spring for autumn sowing is of very great importance. The top spit might even be turned over in the preceding autumn and allowed to lie fallow through the winter. In spring, the area should be dug over to a depth of four inches, raked and allowed to lie fallow for a fortnight or three weeks. At the end of this period, the weeds which will have germinated should be hoed up, the soil again cultivated and incorporated with farm-yard manure and sand or heavier soil, according to its natural texture. The fallowing and hoeing operations should be repeated three or four times to destroy each crop of weeds and so obtain as clean a seed-bed as possible.

The next step is to obtain a good tilth and this necessitates alternate rolling and harrowing of the surface to remove stones, sticks and other rubbish; but rolling should never be done during wet weather. At the time of sowing, the surface of the soil should be dry and have no particle bigger than a grain of wheat. In general practice, people are usually too impatient to perform these valuable preliminary operations, but clean turf cannot possibly be produced on a dirty seed-bed.

A clean, fine, seed-bed, however, is worthless unless great care is taken in choosing the correct seeds, and it is here that a little technical knowledge assists the practical man. A proprietary lawn-seeds mixture may or may not contain seeds of desirable lawn grasses. Many such preparations contain varying amounts of perennial, Italian or short-seeded perennial rye grass, which never knit together to form a close turf, but, sooner or later, die out, leaving bare spaces which rapidly become infested with weeds. The idea that a lawn-seeds mixture must be composed of numerous species is entirely wrong. A beautiful lawn can be produced not only from a single species but from a variety or even a strain. Unfortunately, the seeds of the best varieties and strains cannot yet be obtained commercially. Certain species of Agrostis (bent) and Festuca (fescue) can, however, be obtained with a guaranteed purity and germination, and these, when sown alone or together, produce a beautiful sward. *Agrostis tenuis*, the seed of which is exported in large quantities from New Zealand, is synonymous with *Agrostis vulgaris* and will produce an excellent lawn when sown alone on heavy or medium soils. Chewing's Fescue (also produced in New Zealand), if mixed with *Agrostis tenuis* in the proportion of 7 : 3, will produce a good lawn on most soils, but, in general, the lighter the soil the higher should be the proportion of Fescue to Bent, and *vice versa* on heavier soils.

The substitution of a certain percentage of Hard for Chewing's Fescue is often permissible since this slightly reduces the cost. When purchasing Chewing's Fescue, the percentage germination of the seed should always be insisted upon, since seed two to three years old has always a poor germination.

There is, also, on the market, a lawn seed that goes under various names, including South German mixed bent, German mixed bent, and German bent. This is really a natural hand-gathered mixture of *Agrostis tenuis*, *Agrostis stolonifera compacta*, and *Agrostis canina*, all of which are excellent lawn grasses. *Agrostis canina*, alone, produces a beautiful, fine, green-velvet sward, which has earned for it the name of Velvet Bent; but, unfortunately, the pure seed cannot be obtained commercially in large quantities.

Trials at the St. Ives Research Station indicate that New Zealand *Agrostis tenuis* produces a denser and more even-textured sward than South German mixed bent, while it also possesses the advantage of maintaining a good green colour throughout the winter.

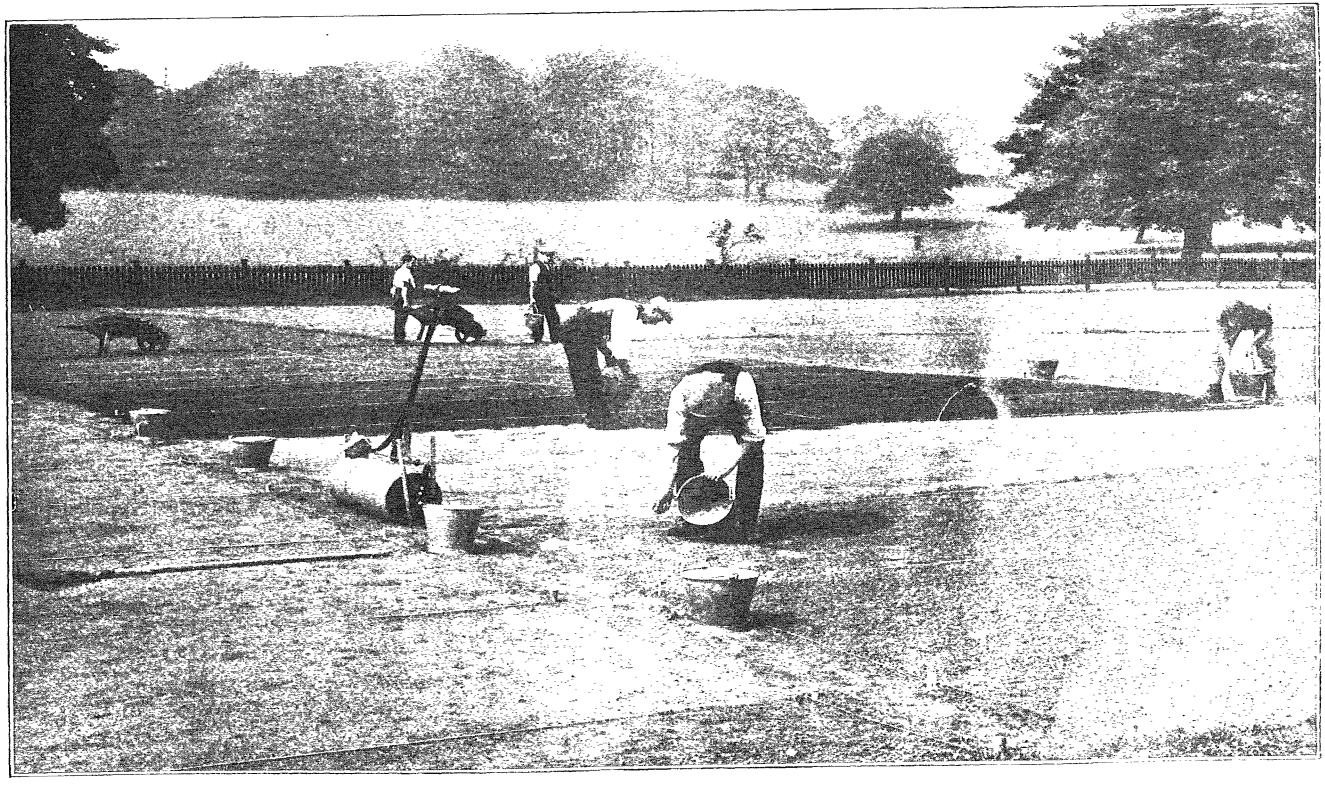
To obtain a fine-textured, closely-knit turf it is necessary to sow at a heavier rate than is generally advocated for a hay crop. Since, however, one pound of bent seed contains five million potential seedlings, it will be readily appreciated that excessive seeding must be wasteful. The data accumulated do not yet enable one to state definitely the most economical rate of seeding for each species or mixture, but preliminary investigations indicate that, to produce a bent sward, the rate need not exceed five pounds per 100 sq. yd. If a mixture of Bent and Chewing's Fescue is used, then the rate of seeding should be heavier.

When sowing down a lawn, the seed should always be mixed with a larger bulk of sifted soil and divided into several equal lots, depending on the size of the area to be sown. The lawn should then be divided into a number of cross strips running at right angles, and each small area sown twice in opposite directions. This procedure for securing an even distribution of seed not only results in a uniform sward but also reduces to a minimum any possible invasion of weeds. After sowing, the whole area should be lightly raked with a lawn rake and then covered with a thin layer of sifted loam. A much quicker germination will be obtained if the covering operation is followed by a light rolling, provided the surface soil is sufficiently dry not to cling to the roller.

Patient preparation of the seed bed, combined with careful sowing of the best lawn seed, will, however, be of little avail if early mowing operations are too severe. It is advisable not to cut the young grass plants until they are three or four inches high and the first cutting should preferably be done with a scythe. Since, however, skilled scythemen are comparatively rare, the lawn mower may be employed, provided the bottom blade is raised. It is exceedingly important that close mowing should not be attempted until the lawn is well established. Before mowing the young grass, light rolling with a wooden roller is advisable, as this assists establishment.

All weeds should be removed by hand immediately they make their appearance because, despite thorough cultivation before seeding, a certain number of weeds will inevitably have escaped. Their early removal, however, assists in the rapid development of a dense sward which will inhibit any subsequent invasion.

Producing a Lawn from Sods.—This method of lawn making, although far more expensive than seeding, is more generally practised, especially on golf courses, because it is quicker,



Method of sowing to ensure even establishment of lawns.

does not require so much skill as seeding and is, consequently, more likely to be successful. It is important, if possible, to use turf from a similar soil. To transport turf from heavy to light soil, or *vice versa*, is unwise, as the two classes of soil support different types of grass.

Sodding is generally a winter occupation. To some extent, this is due to the seasonal distribution of labour, but largely because, if the sods are laid in spring, there is greater risk of drought preventing complete knitting. It is the usual practice among greenkeepers to complete turfing operations by the end of December or early in January, although there are cases where later sodding has proved successful.

The sod-bed is prepared in a manner very similar to a seed-bed, except that prolonged harrowing and fallowing are not so essential. It is important, however, that the surface on which the sods are to be laid should be as true as the finished lawn, and this is best accomplished by alternate scraping and rolling. The whole area must be firm, so that parts of the lawn will not sink after it has been laid. All necessary drains should, of course, be put down before turfing, to obviate the trouble and inconvenience of lifting the sods after they have been laid.

Even more important, perhaps, than securing a firm, level sod-bed, is the choice of good turf and, in this connexion, it is worthy of note that sea-washed turf, with which bowling clubs are so enamoured, is composed mainly of *Agrostis stolonifera* and *F. Rubra genuina*. It is obvious, therefore, in selecting turf, that preference should be given to sods composed mainly of these or closely related species. Such grasses will generally be found on heath or moorland soils.

The desired turf having been selected, it should be *gradually* worked down by mowing and top-dressing before being lifted. When ready for floating, every care should be taken to obtain sods of the same size and thickness, the usual dimensions being 12 in. by 24 in. by 2 in. It is advantageous to float the turf 3 in. thick and then shave the sods down to 2 in. in a trimming box.

In many instances, sods carefully floated have failed to knit in their new habitat, this being usually due to the fact that the sods were not treated after laying. It is essential, when sodding has been completed, to consolidate the surface by rolling in the direction that the sods have been laid, and then to fill in the interstices with compost. This material should contain at least 50 per cent. of sand, as this easily fills up the

spaces between the sods, while further experience has shown that sand helps to bind the sods better than compost. It is recommended that, wherever possible, the whole green should be heavily composted subsequently at regular intervals.

Maintenance of Lawns.—Lawns, whether produced from seeds or sods, cannot be maintained unless they are regularly supplied with food. Without entering into any detailed discussion of the specific manurial requirements of grasses, it is sufficient to state that lawns respond readily to sulphate of ammonia, while sulphate of iron, in addition to encouraging the finer grasses, imparts a beautiful, dark-green colour to the sward. Anyone interested in the theoretical aspect of the subject will find more detailed information in the *Journal of The Board of Greenkeeping Research*, Vol. II, No. IV.

The chemicals mentioned are best applied three or four times a year and should be mixed with good compost. On account, however, of the difficulty and inconvenience of building a compost heap, the following is recommended as a safe, economical, and easy procedure for top-dressing a private lawn once it is established :—

Sulphate of ammonia	3 parts
Calcined sulphate of iron	1 part
Sand	20 parts

This mixture should be combined with an equal quantity of well-rotted leaf mould, rotted grass cuttings, spent hops, malt culms, rape dust, or, failing these, good garden soil, and the final mixture applied at the rate of 8 oz. per square yard. On a newly-sown lawn, it is preferable to give about half this quantity as a first dressing, while, during periods of drought, such as sometimes occur in mid-season, it is advisable to water-in the dressing.

At the end of the growing season, but before frosty weather, the lawn would benefit greatly from a heavy application of sharp sand at the rate of six pounds to the square yard, to be followed, a fortnight later, by an application of compost without chemicals.

A small private lawn produced either from seeds or clean sods can be most conveniently maintained by watering-in a solution of sulphate of ammonia and crystalline sulphate of iron. The crystalline form is preferable to calcined in this connexion, since it is more easily soluble. Effective proportions are 3 lb. sulphate of ammonia and 2 lb. sulphate of iron, dissolved in 100 gallons of water, and applied to 100 square yards, followed by watering without chemicals. When

this method of maintaining a lawn is adopted, a good dressing of leaf mould or compost should be given at the end of the growing season.

A thick, well-established lawn, resulting from systematic topdressing, can be clipped closer and more often than one that is thin and under-fed. The frequency of cutting should, however, be governed by the length of grass and time of year rather than the day of the week. As the dry weather approaches the blade of the mower should be raised and the lawn cut less frequently than during the wet season, while, in very dry weather, mowing should be discontinued.

Renovation of Existing Lawns.—While it is not difficult to describe methods for establishing lawns, or to outline systematic treatments for maintaining them in good condition, the question of improving already existing swards is not so simple. It will be readily appreciated that remedial measures depend primarily on the particular ailment from which the lawn is suffering, while its situation as regards soil and climate have also to be taken into account, although research in recent years seems to indicate that this is of less significance than it was once thought to be. Since, however, certain proprietary articles are advertised to cure all the ills to which lawns are subject, it is felt that this article would not be complete without outlining some general treatment for weed eradication.

The improvement of lawns lies in the eradication of all weeds and the retention of the finer grasses, such as certain species of Agrostis and Festuca which some agricultural workers might rank with the weeds. It follows that any treatment for weed eradication which simultaneously encourages such grasses as ryegrass and dogstail, etc., cannot be applied to lawns.

It has been found in recent experiments* that a few applications of a mixture of

3 parts sulphate of ammonia,
1 part calcined sulphate of iron, and
20 parts sand,

used at 4 oz. per sq. yd., result in the disappearance of the following weeds :—

Wild white clover,	Daisy,
Red clover,	Mouse-ear chickweed,
Birdsfoot trefoil,	Several species of moss.
Yellow suckling clover,	Pearlwort,
Field speedwell,	Ribwort plantain,
Creeping buttercup,	Selfheal,
	Yarrow.

**Jour. Board of Greenkeeping Research*, Vol. II, No. 4.

Of these pearlwort, creeping buttercup, mouse-ear chickweed and yarrow are the most resistant, but can eventually be eradicated.

The success of this treatment depends essentially on fine weather. If rain follows an application, half the potency of the chemicals is lost. The number of applications will depend on the state of weediness of the lawn, but the treatment should be continued at, roughly, fortnightly intervals. When the weeds have disappeared, the sand in the mixture should be replaced by compost, as suggested in the section dealing with the maintenance of lawns.

Tap-rooted weeds, such as broad-leaved plantain, dandelion and cat's-ear, are best eradicated by means of a mixture compounded as follows :—

35 parts sulphate of ammonia,
15 parts calcined sulphate of iron,
50 parts sand.

A pinch of this should be applied to the crown of these weeds during fine weather. A second application, after an interval of about ten days, will generally result in the death of the weeds.

This method of eradication may leave ugly black scars, but this need cause no alarm because the bare areas will ultimately be filled in by grasses.

A mixture of :—

50 parts sulphate of ammonia,
50 parts sand,

is also effective, but the inclusion of sulphate of iron accelerates the destruction of the weeds and counteracts any chlorotic appearance that might accompany the use of sulphate of ammonia alone. The bare patches left after the destruction of the weeds can also be renovated with a seeds mixture, but great care should be taken not to attempt this until the chemicals have been washed away, as they are injurious to young seedlings.

Lawns on heavy clay soils can be considerably improved in texture by a heavy dressing of coke breeze or charcoal, and it is the experience of most practical men that this considerably reduces worm infestation.

* * * * * *

NORFOLK EGG PRODUCERS, LTD.

(EXPERIENCE OF A NATIONAL MARK EGG-PACKING STATION)

Formation and Development.—When the National Mark egg scheme was first propounded in 1928, the Ministry endeavoured to secure the establishment of as many effective packing stations as possible throughout the country. In Norfolk, in order that egg producers in that county should have adequate opportunity to market their eggs on up-to-date lines, the County Branch of the Farmers' Union itself decided to provide packing facilities. In consequence, Norfolk Egg Producers, Ltd., was formed in October, 1928, as a Society under the Industrial and Provident Societies Acts, and premises were acquired in Norwich. The share capital of the Society, which amounted on December 31, 1930, to £853 10*s.* 0*d.*, is in £1 shares, 10*s.* paid, the minimum share-holding per member being two shares.

Packing was commenced in October, 1928—several months before the National Mark scheme was actually launched in February, 1929—so that the Station has now been in operation for three years. The growth of the Society has been extraordinarily rapid. In the 12 months ended March 31, 1930, the first year of operation under the Mark, some 5½ million eggs were handled, while in the following 12 months about 8¾ million eggs were handled. The Society had, in 1930, the largest turnover of eggs of all National Mark egg packing stations. So much has the business expanded that the Society recently had to transfer its operations to new and much larger premises.

Supplies. The Society draws its supplies of eggs from practically the whole of Norfolk, though as far as possible the supply areas of other packers in the county are avoided. The Society endeavours to confine its activities to supplies sent in by members, and practically all the suppliers of eggs —amounting to nearly 300 individual producers in the spring of this year—are shareholders; suppliers are not, however, compelled to contract to send all their eggs to the station for an agreed period, though any member who so desires is at liberty to make such a contract.

While a small proportion of the eggs handled are delivered to the packing station, mainly on market days, 90 per cent. are collected direct from the producers by the Society's two motor lorries, which visit each supplier once a week. Until recently, two 1-ton trucks were used for collection, but the

volume of supplies has now got beyond the capacity of these vehicles, and they have been replaced by two 30-cwt. vans. These vans (Fig. 1) have been specially constructed to facilitate the loading of egg boxes, each side of the van being cut to provide two double-leaved doors. The lorries go out each day loaded with empty cases, and leave the required number at each farm, bringing away ready filled the cases left the previous week. Special cases each holding 15-dozen eggs are used for collection ; they are made of cardboard, strengthened within by wooden struts.

The costs of collection are met by a deduction from the producer's return. This is scaled according to the size of the consignment. The charge amounts to 6*d*. per box of 15-dozen for a consignment not exceeding 6 boxes, 5*d*. per box for over 6 but not exceeding 12 boxes, 4*d*. per box for over 12 but not exceeding 18 boxes, and 3*d*. per box for lots of over 18 boxes.

Grading and Packing.—The new grading and packing building (see Figs. 2 and 3), which provides abundant space and is admirably lighted and ventilated, is planned with a view to a continuous one-way flow of eggs from the point of delivery through the candling, grading and packing processes to the point of dispatch. On arrival at the station, the lorries are unloaded at a door at one end of the building, the cases being carried in and stacked in proximity to the grading machines.

Three grading machines are in regular use (see Figs 2 and 3, respectively) ; another machine is also available as a stand-by in case of breakdowns. Eggs are candled and are then passed direct to the grading machines. The three grading machines are, in normal circumstances, each served by two candlers, but at busy seasons additional candlers are needed to keep the machines running at full capacity. Two packers are required for each machine to clear the graded eggs and pack them into cases. The three machines working at full pressure can grade about 16-17,000 eggs an hour.

The handling of filled cases is reduced to the minimum by the use of a gravity runway, which conveys the cases away from the grading machines to be sealed and stacked at the loading point ready for dispatch.

The whole of the grading and packing operations are carried out by female labour, the number of employees, exclusive of two lorry drivers and a girl clerk, varying from 10 to 16 according to the season. The maximum daily output of eggs



FIG. 1.—Motor vans, specially constructed to facilitate the loading of egg boxes, as used by Norfolk Egg Producers, Ltd.



FIG. 2.—Interior view of the new grading and packing building of Norfolk Egg Producers, Ltd.

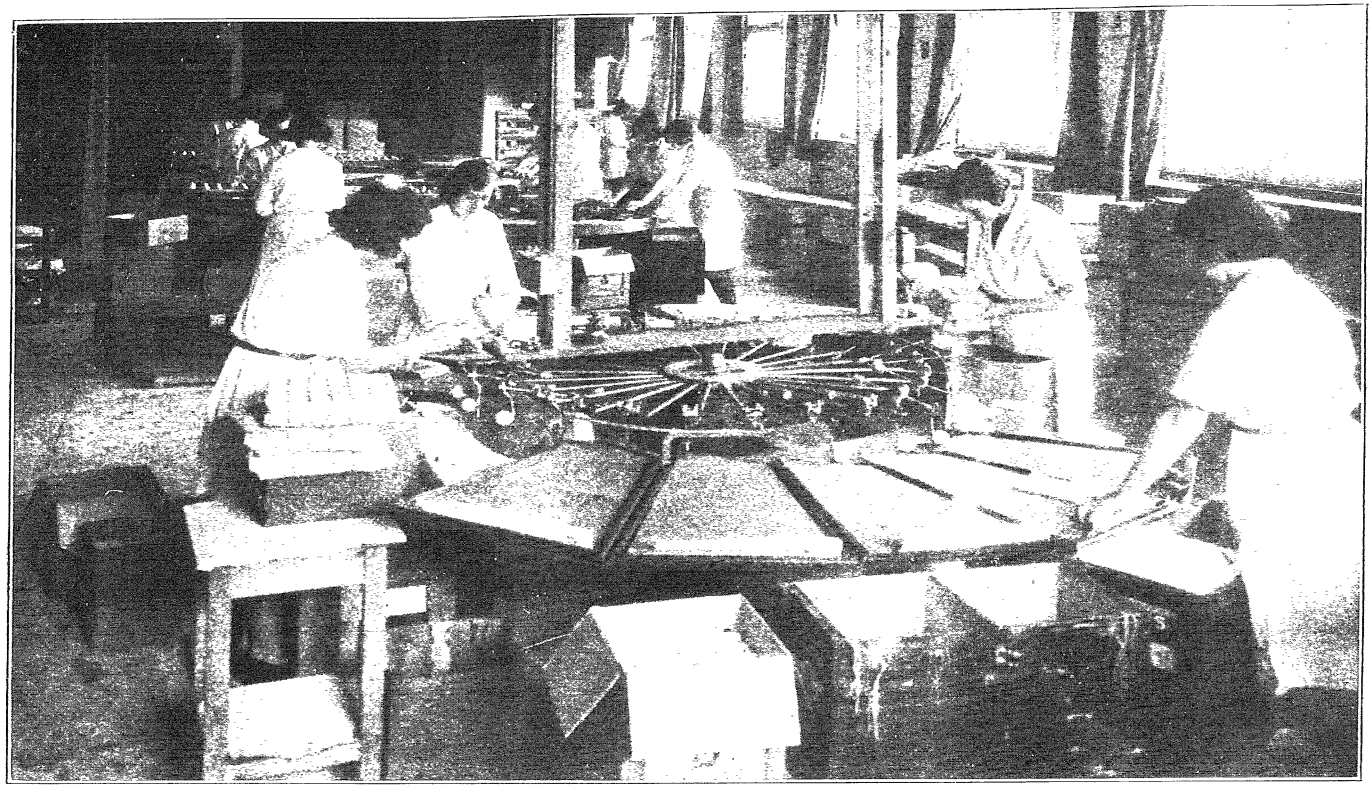


FIG. 3.—Another interior view of the new grading and packing building of Norfolk Egg Producers, Ltd.

so far attained with three grading machines in operation has been some 62,000 eggs.

This station is one of those that have been used by the Ministry for the training of candlers, and since March, 1929, 15 candlers have been trained at this centre.

Distribution of Supplies.—Practically the whole output of this station is consigned daily to London—a distance of over 100 miles. One large buyer takes the majority of the *Standard* and *Medium* grade eggs; *Special* and *Pullet* grades are delivered to a number of retail shops in London. Second-quality eggs are sold locally; cracked eggs, other than those retailed at the premises, are broken into 15-lb. tins and kept in rented cold-storage space until required for sale to confectioners. A local outlet has recently been found for "pulp" for pheasant rearing.

Consignment of eggs to London is done by hired motor transport: rail transport is not used. The contractor's charge, which is at a flat rate per box, whether returnable or non-returnable, works out at about 11*d.* per 360 eggs.

As a matter of economy, the station has recently adopted an approved wooden returnable 30-dozen case for *Standard* and *Medium* grades; supplies of this case are made locally and cost 3*s.* each, exclusive of fittings, which amount to another 7½*d.* per case. No extra charge is made by the road haulage contractor for bringing back empty returnable cases. *Special* and *Pullet* grades are sent out in non-returnable, 15-dozen fiberite cases costing about 8*d.* inclusive of fittings.

Financial Arrangements.—(*a*) *General.*—Payment is made to producers for their eggs by cheque, monthly. The method used is that of payment according to National Mark grades, the rate for each grade being based on the average price received each week minus collection charges and a margin to cover costs. Any profits accruing during the year, after providing for interest at the rate of 5 per cent. on paid-up share capital, are distributed to members in proportion to the value of eggs supplied. The bonus paid out of profits for the two years ended September 30, 1930, was at the rate of 3*d.* in the £. Non-members supplying eggs do not participate in the bonus.

(*b*) *Capitalization.*—The capitalization of this station as represented by fixed assets is of interest as fairly indicating what is required for a station handling at least eight million eggs per annum and renting its buildings. The following figures give the value at cost (not written-down values as

shown in the Society's balance sheet) of the fixed assets of the Society in July, 1931 :—

	£ s. d.	£ s. d.
Motor Vans (two)		478 0 0
Depot Equipment :—		
1 Frost Grader	84 10 0	
2 B.M.R. Graders	165 0 0	
1 Avery Grader	67 0 0	
Gravity Conveyor	52 10 0	
Stools, Benches, Tables, Candling Lamps, etc. ..	45 0 0	
		414 0 0
Boxes and Packing Material ..		150 0 0
Office Equipment		30 0 0
		£1,072 0 0

(*c*) *Costs.*—The costs incurred by the station are summarized in the table below for the two years ended March, 1930, and March, 1931, respectively, and provide an interesting object lesson in the economies that can be effected as a business of this kind expands and gains in experience and efficiency.

The average gross costs incurred per 120 eggs during the 12 months ended March, 1930, amounted to approximately 1*s.* 8½*d.* (almost exactly 2*d.* per dozen). Of this, the cost of collection of eggs from farms made up about 4½*d.* In the processes of grading and packing, expenditure amounting to some 3¼*d.* per 120 was incurred, of which it may be estimated that 1¾*d.* was in respect of grading and candling, 1½*d.* in respect of packing. The total cost of distributing eggs amounted to approximately 11¼*d.* per 120. Distribution costs include, in addition to the actual packing costs (1½*d.*) above mentioned, the cost of packing material (6¼*d.*), *i.e.*, cases, fittings, labels and so on, and that of transport (3½*d.*). Overhead expenses, which include that proportion of wages and salaries chargeable to administrative work, as well as advertising, postage, stationery, and other office expenditure, adds a further 3*d.* per 120. Of the gross cost, about 3½*d.* was recovered in the form of charges for egg collection (3*d.* per 120) and Government grants and miscellaneous receipts (½*d.* per 120).

In the second year, average gross costs were reduced to about 1*s.* 5½*d.*, *i.e.*, by about 3*d.* per 120. Part of this reduction is certainly due to increased turnover, which has had the effect of reducing the incidence of overhead charges. Thus, overheads, which showed very little increase in actual amount, in spite of the extra business done, averaged only 2*d.* instead of 3*d.* per 120. Some saving—almost ½*d.* per 120—was also

effected in collecting costs, which amounted in the second year to about 4*d*. This saving was probably due to the increase in the number of suppliers, which enabled a lorry load to be made up, on the average, in a shorter distance. One of the principal economies has been in the cost of packing material for distribution purposes. This has fallen by 1½*d*. per 120 eggs and the total cost of distribution has dropped from 11¼*d*. to just over 9½*d*. The main saving is attributed to the use of returnable cases instead of non-returnables. The circumstances of this station lend themselves ideally to the use of returnables: all deliveries are made by road, and, in the case of eggs packed in returnables, are all sent to one buyer, the delivery vehicles returning direct loaded with empties. Losses are thereby largely eliminated and the work of recording empties out and in is greatly simplified. It is unlikely that equal economy would result from the use of returnables under other conditions. The cost of grading and candling has not fallen as a result of increased turnover, which has necessitated the installation of new grading machines capable of dealing with a larger throughput than at present handled. It will be noted that the charge made for collection was not excessive. It averaged about 3*d*. per 120 in both years and did not, in fact, cover more than about three-quarters of the actual cost incurred.

SUMMARY OF COSTS AND RETURNS PER 120 EGGS IN 1929–30 AND 1930-31

	1929–30		1930–31	
Costs :—	*d.*	*d.*	*d.*	*d.*
Collection		4·34		3·98
Candling and Grading		1·80		1·86
Distribution :—				
Packing	1·48		1·52	
Packing Material	6·24		4·78	
Transport	3·53	11·25	3·36	9·66
Overheads		3·05		2·01
	s.	*d.*	*s.*	*d.*
Gross Cost		1 8·44		1 5·51
Less : Collection Charges recovered	2·96		3·12	
Other Credits	·49	3·45	·05	3·17
Net Cost		1 4·99		1 2·34
Egg Prices :—	*s.*	*d.*	*s.*	*d.*
Average sale price	18	5·79	16	2·62
Average purchase price*	16	9·94	14	6·55
Margin	1	7·85	1	8·07

* Gross (before deducting collecting charges).

(*d*) *Margins.*—The margin between purchase and selling prices of eggs was in both years sufficient to cover costs and leave a balance of profit which, as has been indicated, is distributed on co-operative lines to members. The difference between the gross purchase price (before deducting collection charges) and the average sale price was about 1*s.* 8*d.* per 120 in each year. As collection charges averaged about 3*d.*, the actual margin to cover gross costs was, therefore, approximately 1*s.* 11*d.*

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THE MANAGEMENT OF MILCH GOATS

S. LEIGH HUNT,
Ministry of Agriculture and Fisheries.

IN these days, when the value of pure milk receives such wide recognition, it is difficult to understand why the goat does not occupy a more important place in the national economy. Goats' milk is palatable, rich in butterfat, and practically immune from tubercle bacilli. Owing to the fine separation of the fat it is easily assimilated by infants and invalids, while excellent cheese and butter may be made from the whole milk. Remarkable cures in cases of infantile malnutrition have been claimed for a diet of goats' milk alone. Everyone who has lived in the country knows that milk is frequently most difficult to come by in districts that produce the largest quantities, so that cottagers and others can scarcely obtain a sufficient supply for their families. In such circumstances, the advantages of goat-keeping are obvious, but, even in urban areas, it is possible to keep a milch goat provided that the local sanitary authority and the owner of the premises are agreeable, and that adequate accommodation, a supply of cheap green food, or access to rough grazing, and facilities for exercise, can be secured. In an enclosed yard, jumping stools or boxes will provide the goat with means for indulging its natural propensities in the matter of exercise.

Purchase.—Non-pedigree or half-pedigree goats can be purchased at reasonable prices. Weakly, undersized or coarse-looking animals should be avoided, but any goat that is healthy, well-grown and in good condition, and shows an essentially feminine character in shape and appearance, will probably pay well for its keep. Careful inquiry should be made as to the milk-yields of the animal and its ancestors. For household purposes, long lactation is a more important factor than the quantity yielded on any given occasion. The real tests of a

good milker are the total annual yield, and the cost at which it is produced. Milk production can be increased by high feeding, but the goat with a moderate yield, that milks steadily for 9 or 10 months in the year, is the most profitable animal. Goats can be kept in milk for two years or more, under proper conditions, provided they are not mated. A goat that will give from 100 to 150 gallons may be considered a moderate milker, but exceptional specimens may yield a far greater quantity. The record yield in 24 hours in this country is 21 lb. 6 oz., approximately 8⅓ quarts.

During the recorded year ended October 1, 1930, the goat Ch. Springfield Precocity Q*Q* gave a yield of 5,050 lb. 15 oz., approximately 493 gallons, and Didgemere Druidess** gave 4,067 lb. 2 oz., or about 397 gallons, constituting a record for a first kidder. These goats kidded respectively in September and August of the previous year.

The chief points of a good milker are a neat and refined head, large, bright eye, slender neck, body wedge-shaped whether viewed in profile or from above, wide loins and hips, with well rounded ribs. The udder should be capacious, but not fleshy, carried well forward, but not long or pendulous, its skin fine in texture and the teats of such size and shape as to facilitate milking. Intending purchasers should make a point of seeing the goat milked, not only to ascertain the yield but to ensure that the animal stands quietly while milking is in progress. Impatient and injudicious treatment may render a goat permanently troublesome in this respect.

Breeds.—It is improbable that any truly wild goats survive in this country, although, in remote districts, descendants of the domestic animal may sometimes be found roaming at large. The British Goat Society provides a section in its Herd Book for the English variety. The principal domesticated breed is the " British " which, being the product of different crosses, does not breed true to colour, although it is usually true to type. The Toggenburg and the Saanen are the only pure imported breeds now kept in this country. Other varieties that include Swiss blood are the British-Alpine, British-Toggenburg and British-Saanen. The Anglo-Nubian is a fine-coated, lop-eared variety, formed by crossing goats from India and Egypt with the English goats. All these varieties are more or less short-haired. The Irish and Welsh breeds have long hair ; their coats afford good protection against the humid climatic conditions that prevail in the western parts of the British Isles. They have not been bred to any extent on selec-

tive lines. Speaking generally, breeds of Swiss type are better milkers than the Anglo-Nubian and English varieties, though their milk usually contains a smaller fat-content.

Breeding.—In a state of nature, goats breed once a year, the period of gestation being about 21 weeks. The domesticated animal will, however, sometimes breed twice a year. The pairing season lasts from September to February or March according to latitude, but it is desirable that mating should take place as early as possible, in order that the kids may arrive in time to benefit by the spring and summer months. From September till December, or even till January, nannies come in heat about every three weeks ; from then till the close of March the intervals are longer, and after that month only occur very exceptionally till the following August or September. Goats being gregarious in habit it is advisable, if possible, to keep two, mating one in September and the other towards the end of November.

Signs of oestrum or " season " consist of continuous bleating and shaking of the tail, loss of appetite, general restlessness, swelling of the vulva, and a temporary diminution in the milk yield, if any. This condition may last from one to three days. The billy selected for mating should be a well-developed animal bred from a good milker, or preferably having " milking-blood " on both sides of his parentage. He should be well fed, sufficiently exercised and kept scrupulously clean. In times past one of the great obstacles to successful goat keeping has been the scarcity of good stud goats. Service fees have been charged that were quite prohibitive to the majority of rural goat-keepers. To remedy this state of affairs, a scheme has been operated during the last seven years by the British Goat Society, with financial assistance from the Ministry, under which premiums are paid to owners of approved stud goats for services at nominal fees to female goats owned by cottagers, smallholders and others. Already there is a marked improvement in the stock kept by these classes, while the milk yields of the resultant progeny have proved highly satisfactory. A list of stud goats registered under this scheme may be obtained on application to Mr. H. E. Jeffery, Secretary of the Society, Roydon Road, Diss, Norfolk.

Rearing.—Two or three months before kidding, fat-producing rations should be reduced. A nanny about to kid is best left to herself in a good shed with plenty of dry litter. Male kids are not profitable to rear and should be destroyed at birth, unless bred from valuable animals. Indeed, it is more

economical to destroy the female kids also, unless both sire and dam are of good strain, and the latter is a fair milker. If the kids are kept, they should be allowed to take as much milk from the mother as they can consume, for a period of 6 to 8 weeks at least, but if they can be suckled for three months they will grow much faster and become more valuable animals. If a single kid is being reared, it may feed from one side of the udder, in which case the other side must be milked out regularly. Good milkers often carry more milk than the kids consume, and the surplus should be drawn off once a day.

Some breeders remove the kids from the mother soon after birth and rear them by means of a feeding bottle, believing that more milk is obtained in this way. If this is done, the kids should be allowed to suck for three or four days, as the "beestings" or first milk then given possesses valuable laxative properties. The feeding bottle is preferable to a basin or pail, as it aids digestion and obviates the diarrhœa that frequently results from the kid's imbibing deep draughts of milk. At first the kids should be given from ¼ to ½ pint of their mother's milk, freshly drawn or heated to blood temperature, four or five times a day, the amount being regulated so that not a drop is left. After the first week, the number of meals may be decreased to three and the quantity of milk correspondingly increased. For the second week, about 1 quart should be fed to each kid daily; for the third week, about 3 pints; for the fourth, about 3½ pints. When a month old, the kid will begin to eat solids such as hay, grass, weeds, young twigs and leaves. Linseed cake, oats and cracked maize should also be given, but the quantity of such concentrated food must be limited to 2 or 3 oz. daily. After the fourth week, skim milk with a little linseed and oatmeal tea, or one of the calf meals on the market, may be substituted for some of the whole milk, but the latter should not be entirely disused until the kids are three months old. During the next two or three months, liquids should be gradually replaced by solid food.

Milking.—Milking is an operation that should be carried out regularly, rapidly and completely. With the exception of food and water, nothing influences yield more than regularity in milking. For the first three or four days after kidding, the milk is especially adapted to the kids and the large proportion of mucus present renders it unfit for human consumption. After that time, however, the goat can be milked twice daily; two milkings daily have been found sufficient even for goats with record yields.

More milk is said to be obtained when it is drawn rapidly. Moreover, with slow milking, a goat may become restive and upset the pail. An impatient animal should be watched carefully towards the end of the milking, and it is advisable for the milker to have a second pail handy in which to pour the milk as the process goes on. To keep a goat in long lactation, it is essential that the udder should be gently massaged towards the end of the milking in order to obtain the " strippings " or last drops, which are always the richest.

A goat milking for the first time frequently gives considerable trouble, and unless great patience is exercised she may be spoilt as a milker. Before milking, the udder should be wiped with a clean, damp cloth to remove all dust or dirt and thus prevent it from falling into the pail. Immediately after milking all utensils should be rinsed in cold water, then well washed in warm water to which soda has been added, then rinsed in clean hot water, and, finally, placed for a few minutes in boiling water, or steamed. They should then be placed mouth downwards in the dairy until required for use. If properly boiled or steamed, the heat of the utensil will suffice to dry off all moisture without wiping. It is essential, before commencing to milk, that the milker's hands should be clean. Milk should not be brought into contact with any strong-smelling substance. It should be strained at once into its proper receptacle through a clean butter-cloth, or, preferably, through a cotton-wool strainer sold for the purpose; the strainer should be carefully cleansed and sterilized after use. The milk must be stored in a cool place.

Milk Recording.—Goats may be recorded, under the Ministry's scheme, on the same conditions as for cows, if the milk recording society concerned considers that the size of the herd will justify the labour and expense incurred in checking the records. Particulars of this scheme are contained in Form No. 392/T.L. which will be furnished by the Ministry on application, together with the name and address of the Secretary of the Milk Recording Society for the particular district.

Housing.*—A goat can be accommodated in any sort of shed or outbuilding provided it is clean, dry, well ventilated and warm. The floor should be of some impervious material such as concrete, and a raised bench or wooden slats should be

* Detailed plans (scale ½ in. to 1 ft.) of a model house for two goats, with fodder store, may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 3*d.*, or post free 3½*d.*

provided for the goat to sleep on. Bricks should not used for the floor. If no bench or wooden flooring be provided, straw, dry leaves, bracken or other rough litter must be used. Peat moss is a useful material, but the wetted portions must be removed daily or the whole soon becomes damp.

Feeding.—Scrupulous cleanliness must be observed, both in the food itself, and in the receptable in which it is served. The best form of the latter is an enamelled bowl. Wooden mangers are difficult to keep sweet and the goats gnaw them. They will refuse anything that is not sweet and clean, hence no food should be placed on the ground. Cabbages and other green stuff should be hung up by the roots. Variety in feeding is essential; no animal tires of a monotonous diet so rapidly as the goat. Frosted foods should never be given. If a hayrack is used, the width between the bars should not exceed 1½ in. and a board on which the fodder that has been pulled out can drop should be fixed under the rack; it may be useful to have a board on the top of the rack also. These precautions will help to prevent waste. Goats will eat garden produce of all sorts, hedge clippings, acorns, roots, weeds—such as sow thistles, young nettles, plantains, meadow-sweet, docks and dandelions—as well as hard, woody plants, but they prefer leguminous plants like vetches or tares, sainfoin, lucerne and clover. Foxglove, hemlock, privet (berries), laurel, rhododendrons, and yew should not be given to goats, as they are poisonous. Sprouted potatoes may be injurious, and should be boiled before use, the water being thrown away.

Milking-goats may have two or three handfuls of corn or cake daily, and, when the lactation period extends through the late autumn or winter months, some concentrated food, such as grain, meal or cake, will be necessary if a satisfactory milk yield is to be obtained. Mangolds and swedes may be given cut in halves, or sliced or pulped, and sprinkled with bran or middlings. As a substitute, sugar-beet pulp may be fed after being well soaked in water. Lucerne or clover hay should form the staple food for winter. Fresh, clean water should be within reach, or be offered twice daily; in winter and before kidding it should be given tepid. Rock salt should always be available. If cabbage be fed, it should be given after the milking to avoid possible taint to the milk.

An average-sized goat (weighing from 100 lb. to 150 lb.) requires from ½ lb. to 1 lb. of concentrated food (corn, flaked maize, bran, etc.), 3 lb. of hay and from 1½ lb. of 2 lb. of roots, sugar-beet pulp or green food per day as a maintenance ration,

To this should be added 4 oz. of concentrated food and additional green food in proportion for every 1 lb. of milk produced, if the best results are to be obtained.

Two concentrated food mixtures can be made up as follows :—

No. 1.—Linseed cake, 1 part by weight.
Oats 1 ,, ,,
Bran 1 ,, ,,

No. 2.—Decorticated soya-bean cake, 3 parts by weight.
Flaked maize 4 ,, ,,
Bran 4 ,, ,,

Goats should be groomed regularly with a dandy brush. Curry combs should not be used. The hoofs should be trimmed regularly, the overgrowing hoof being cut down with a sharp knife till almost level with the pad. If this is not done lameness and foot-rot will ensue. Goats that are much in the stable or confined by a tether, must have regular exercise, which can be obtained in a small enclosed yard.

Pasturing.—Unless adequate pasturage is available, a goat will thrive better under the stall-feeding system, provided it is given a varied diet and sufficient exercise. Under favourable conditions, however, goats may be almost entirely supported during the spring and summer months by being allowed to range at large on a suitable pasture. Tethering may be by means of a light chain attached to an iron pin driven into the ground. Another plan is to use a length of thick, galvanized wire, or preferably a thin wire rope, say 20 yards or more in length, stretched firmly along the surface of the grass and securely pegged down at each end. The goat may then be attached to the wire by means of a short chain, one end of which is fastened to its collar, and the other to a ring "traveller" on the wire, thus giving the goat a run of 20 yards. This method allows more liberty than when a single pin is used. A small, portable shelter should be placed at one end of the wire to provide protection from wind and rain. The pin should be moved to a fresh spot two or three times daily. Its length will vary from 1 to 2 feet, depending on the nature of the soil. It should be driven close down to the ground level to prevent the chain from getting wound round it. Tethering should not be attempted from the middle of October to the beginning of April. Grass in winter is much reduced in nutritive value, and exposure to the elements, without the necessary shelter or exercise to promote circulation, often causes lung trouble and diarrhœa. It is desirable, also, that the transition to grass in the spring should be gradual. Goats must never be kept on wet ground. When turned out to graze, shelter should be

provided to which they can resort in stormy weather. Goats thrive better on rough grazing such as moors and commons than on rich pastures, as they require a varied diet and will consume brambles, broom, furze, heather, etc.

Butter.—Butter made from goats' milk has two disadvantages. It does not keep so well as ordinary butter, and, owing to the small quantity of lactochrome present in the milk, it is practically colourless. The first disadvantage is of slight importance if only sufficient butter be made to meet household requirements. The second can be easily remedied by the addition of a little colouring to the cream. A certain amount of personal tuition is desirable before attempting to make butter from goats' milk.

Cheese.—The best class of cheese to make from goats' milk, provided that the maximum amount to be treated does not exceed three gallons, is one of the smallholder type, regarding which detailed instructions are contained in the Ministry's leaflet No. 325. The milk, being rich in fat, requires careful treatment, and the following points should be observed :—

(*a*) The renneting temperature must be slightly higher than that customary in the case of cows' milk, *i.e.*, 86½° to 87° F.
(*b*) The amount of rennet should be slightly larger, say, 22 drops per gallon of milk.
(*c*) The curd must be cut very carefully.
(*d*) When scalding the curd, the temperature must be gently raised at first.
(*e*) On placing the cheese in a press or under weights, only slight pressure should be applied at first.

Manure.—Goat droppings are suitable for general manurial purposes, but owing to their high concentration they must be used in relatively small quantities. For sown crops, it is advisable to dig in the manure before sowing seed.

Chickens thrive on the separated milk of goats, and cockerels fatten quickly if their mash is mixed with it. Any poultry-keeper who has a small plot of land will profit by keeping a good goat on it. Provided that the runs have not been overstocked with poultry, goats tethered in them will keep the grass fairly short, and consume the weeds.

Apart from milk production, the goat has uses that fall outside the scope of this article. Enough has been said, however, to indicate the importance of the milch goat as an asset in the economy of food production.

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MARKETING NOTES

National Mark Eggs.—In August, the output of the National Mark egg packing stations was returned as 21·7 million eggs, of which 17 million were packed under the National Mark, representing an increase of 35 per cent. over the number of eggs packed under the Mark during the corresponding month of 1930.

Egg dealers who are not National Mark packers are finding it increasingly necessary to test and grade their supplies for the sake of their trade connexions.

One of the results of the National Mark egg scheme is the impetus which it has given to the invention of apparatus for the grading and testing of eggs and to the production of improved types of non-returnable packages, and of fillers and packing materials generally. Lists of manufacturers of these requirements may be had on application to the Ministry.

The experiment of including classes for National Mark eggs at the Dairy Show, tried last year, was so successful that similar classes are to be provided in this year's Show, which is to be held from October 20-23 at the Royal Agricultural Hall, Islington. A number of authorized packers competed last year, and it is hoped to secure an even larger entry this year.

In view of the difficulty experienced by some authorized packers in disposing of eggs of the lower weight grades, a leaflet (listed as No. 44 in the Ministry's Advisory Series, and entitled *The Maintenance of Egg Size*) has been prepared for egg producers. Single copies may be obtained gratis on application to the Ministry.

Reference was made in last month's (September) issue of this JOURNAL to the widening sphere of operations of Dorset Egg Producers. The Ministry is informed that this organization has now taken over the egg business of West of England Egg Producers, Ltd., of Puddletown, Dorset. With this accession of supplies, Dorset Egg Producers will become one of the largest packers of National Mark eggs in the country.

National Mark Dressed Poultry.—Six stations are now operating in the Scheme, Messrs. Goldsmith Bros., of Northgate Street, Bury St. Edmunds, Suffolk (Station No. 246), having been authorized at the beginning of August. A steady increase of output under National Mark labels is being maintained, and returns from the packing stations show that over 50 per cent. of their total output is being packed under the

Mark. Inquiries from prospective packers continue to be received.

National Mark Fruit.—The Imperial Fruit Show, which was the scene last year of some remarkable successes on the part of authorized National Mark apple and pear packers, is being held this year at the City Exhibition Hall, Manchester, from October 30 to November 7, when it is expected that the National Mark will again be much to the fore. Owing, however, to the inclement weather, crops have suffered in quality and it is expected that the proportion of gradeable fruit will be lower than usual.

Tomatoes packed under the Mark are reported to have been on the markets in larger quantities than a year ago, and to have met with a satisfactory demand.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during August, 1930, and August, 1931, and the number of sides graded and marked for the five weeks ended September 19, 1931, were as follows :—

		Number of sides
LONDON		
Weekly average	August, 1930	1,377
,, ,,	,, 1931	1,496
Week ended	August 22, 1931	1,385
,, ,,	,, 29, 1931	1,783
,, ,,	September 5, 1931	1,422
,, ,,	,, 12, 1931	1,786
,, ,,	,, 19, 1931	1,801
BIRKENHEAD*		
Weekly average	August, 1930	431
,, ,,	,, 1931	127
Week ended	August 22, 1931	100
,, ,,	,, 29, 1931	165
,, ,,	September 5, 1931	104
,, ,,	,, 12, 1931	196
,, ,,	,, 19, 1931	257
SCOTLAND*		
Weekly average	August, 1930	2,248
,, ,,	,, 1931	1,070
Week ended	August 22, 1931	1,038
,, ,,	,, 29, 1931	1,139
,, ,,	September 5, 1931	1,016
,, ,,	,, 12, 1931	1,189
,, ,,	,, 19, 1931	973

* Sides consigned to London.

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

TOTAL LONDON SUPPLIES (All Sources)		*Number of sides*
Weekly average ..	August, 1930	4,056
,, ,, ..	,, 1931	2,693
Week ended ..	August 22, 1931	2,523
,, ,, ..	,, 29, 1931	3,087
,, ,, ..	September 5, 1931 ..	2,542
,, ,, ..	,, 12, 1931 ..	3,171
,, ,, ..	,, 19, 1931 ..	3,031
BIRMINGHAM		
Weekly average ..	August, 1930	143
,, ,, ..	,, 1931	493
Week ended ..	August 22, 1931	537
,, ,, ..	,, 29, 1931	559
,, ,, ..	September 5, 1931 ..	605
,, ,, ..	,, 12, 1931 ..	626
,, ,, ..	,, 19, 1931 ..	638
LEEDS		
Weekly average ..	August, 1931	369
Week ended ..	August 22, 1931	379
,, ,, ..	,, 29, 1931	392
,, ,, ..	September 5, 1931 ..	401
,, ,, ..	,, 12, 1931 ..	453
,, ,, ..	,, 19, 1931 ..	463
BRADFORD		
Weekly average ..	August, 1931	396
Week ended ..	August 22, 1931	395
,, ,, ..	,, 29, 1931	412
,, ,, ..	September 5, 1931 ..	399
,, ,, ..	,, 12, 1931 ..	415
,, ,, ..	,, 19, 1931 ..	368
HALIFAX		
Weekly average ..	August, 1931	81
Week ended ..	August 22, 1931	90
,, ,, ..	,, 29, 1931	90
,, ,, ..	September 5, 1931 ..	93
,, ,, ..	,, 12, 1931 ..	104
,, ,, ..	,, 19, 1931 ..	101

The total number of sides graded and marked in the London area during August showed no marked change from the July figures, although the number of sides graded at Islington Abattoir was appreciably higher than in August, 1930. The use of private marks for Scotch beef continued to decline, but the quantity of ungraded Scotch beef at Smithfield during the month was considerable. There was a slight increase in the number of Scotch sides carrying the National Mark.

Canadian beef of high quality continued to reach the market, and obtained top prices. A few sides were graded and marked with the official "Canada" mark.

The number of sides graded and marked for the Birmingham

area showed a steady improvement during August, rising from 410 for the week ended August 8 to 559 for the week ended August 29. In the week ended September 19, 638 sides were graded and marked; this figure has not been exceeded since the week ended December 30, 1930. While this improvement was partly due to the extension of the scheme to an increased number of private slaughterhouses in the area, the figures also reflect a more favourable attitude towards the scheme on the part of the retail trade. A number of retail traders have signed a petition asking the wholesale meat salesmen to return to the system of grading on the wholesalers' stalls in the City Meat Market.

The decision of the wholesalers in Leeds, towards the end of July, to stop having their beef graded before sale naturally caused a decline in the figures of the scheme for the Yorkshire area. During August, however, there was a steady and significant increase from week to week in the number of sides graded and marked. The arrangements made by the Ministry to enable the retailers to have their beef marked after purchase is working satisfactorily, and it is significant that there was no reduction in the number of sides marked in private slaughterhouses.

Inter-Departmental Committee.—The progress of the National Mark beef scheme was reviewed in 1930 by an Inter-Departmental Committee under the Chairmanship of Lord Henry Cavendish Bentinck. The Committee recommended in its Report (Cmd. 3648) that the scheme should be continued experimentally both in London (including supplies from Scotland and from Birkenhead) and Birmingham for a further year, and should be extended to one or two more centres. The scheme has been in operation since October, 1929, in London; since November, 1929, in N.E. Scotland and Birmingham; and since January, 1931, in Yorkshire.

The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have now jointly appointed a Committee to review the progress made during the further year of operation by the English and Scottish schemes for grading and marking beef according to the regulations made under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, and to make recommendations. The Committee is composed of Lord Kirkley (Chairman), Captain Sir Ernest Bennett, M.P., the Earl of Dalkeith, M.P., Mr. D. M. Graham, M.P., Viscount Lymington, M.P., Mrs. L. Manning, M.P., and Mr. H. F. Owen, M.P. Communications should be

addressed to the Secretary of the Committee, Mr. C. H. Blagburn, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

National Mark Canned Fruit and Vegetables.—Further enrolments as authorized canners in the scheme have been effected as follows :—

The Yorkshire Canning Co., Ltd., Hambleton, Yorks.
Joseph Farrow & Co., Ltd., Peterborough.

The growth of the canning industry in England and Wales has made such rapid strides that, whereas two years ago it is calculated that there were only about 20 firms producing canned fruits and vegetables—many of them with only a small experimental output—there are now not less than 45 firms, operating 54 factories. These are engaged in production on a commercial scale with automatic or semi-automatic canning machinery. The plant used varies from a single medium-sized canning "line" to several large-capacity, fully automatic lines. Already 26 of these firms, operating 34 factories, have received authority to apply the National Mark, which, in some cases, will appear on the whole of the first-quality output from the factory. A further list of applicants for enrolment is receiving consideration.

The examination, at the Campden Research Station, of some hundreds of sample cans of fruit and vegetables taken at the factories while canning has actually been in progress, shows this year's National Mark pack generally to be of very fine quality. The results bear testimony to the increasing efficiency of the staffs at the canneries, to whom credit is due for maintaining under the pressure of the "rush" periods the high standards set up by the National Mark scheme. The examination made at Campden is very thorough, and criticisms and suggestions put forward by the experts there are communicated without loss of time to the canners for their guidance.

Reports from canners show that sales have been highly satisfactory. Once again a large portion of the pack has been completely cleared from the factories with the close of the canning season for fresh fruits.

National Mark Cider.—Authority to apply the National Mark has recently been granted to the following firms, the last two being bottlers :—

Robert Clapp, Somerset Cider Stores, Baltonsborough, Glastonbury, Somerset.

Carlisle and District State Management Scheme, 19 Castle Street, Carlisle.
H. G. Thornley, Radford Hall Brewery, Leamington Spa, Warwickshire.

The total number of packers authorized in the scheme is now 61, consisting of 35 manufacturers and farm cider makers, 2 associations of farm cider makers, and 24 bottlers. Four further applications are under consideration.

The following additional premises of authorized packers have been approved and the premises included in the packers' certificates of authorization :—

Jewsbury & Brown, Church Stretton, Salop.
John Lovibond & Sons, Ltd., St. Ann's Brewery, Salisbury.
Findlater, Mackie, Todd & Co., Ltd., London Road, Bexhill-on-Sea.

The National Mark Cider Trade Committee considered on August 20 what alterations should be made in the Agricultural Produce (Grading and Marking) (Cider) Regulations, 1931, for the forthcoming season. In the light of a preliminary report by the Government Chemist on his analysis of samples of National Mark cider, the Committee agreed that no alteration should be recommended apart from excluding citric acid from the permitted foreign acids.

An association of farm cider makers has been formed in Devon.

With very few exceptions, both large and small makers of National Mark cider speak of an increased consumption of cider. Reports from authorized packers indicate increased sales since cider was put under the Mark, while many distributors insist that only National Mark cider should be supplied. A large firm of distributors which has recently been enrolled in the scheme has also decided that it will sell only National Mark cider in future. It is interesting to note that four National Mark packers have either recently extended their orchards or propose to do so, and that a firm of brewers has now arranged for the whole of its brewing premises to be utilized for cider-making only.

Publicity for National Mark Produce.—During September, National Mark beef was advertised in the Birmingham, Leeds and Bradford newspapers, and in the *Meat Trades Journal*; National Mark apples and pears in the trade press and in the *Horticulturist*; and National Mark canned fruits and canned vegetables in the trade press, certain women's journals and in the *Hospital*.

The second of the series of National Mark posters on the advertising frames of the Empire Marketing Board, which have been leased to the Ministry for certain periods of the year, appeared on September 30 and will continue until October 21. The posters, which advertise National Mark flour, cider, canned fruits and canned vegetables, are being displayed in the following areas: Greater London; Birmingham and Wolverhampton; South Lancashire; Leeds, Bradford and Halifax; Derby, Leicester and Nottingham; Cardiff; and also in Bristol, Norwich and Blackpool.

For some time past, prices of graded cattle and sheep have been broadcast each evening in the B.B.C. National programme. An arrangement came into operation on August 31 whereby the prices of the following will be broadcast in future in the programmes mentioned on the days stated:—

Mondays: London, dead meat; National.
Tuesdays: Leeds, National Mark beef; Northern Regional. Birmingham, National Mark beef; Midland Regional.
Thursdays: London, dead meat; National. Manchester (and possibly Leeds), National Mark fruit; Northern Regional. Birmingham, National Mark fruit; Midland Regional. London, National Mark fruit; London Regional.

National Mark Flour at the Confectioners' and Bakers' Exhibition.—The competitions at the Confectioners' and Bakers' 35th International Exhibition, held at the Royal Agricultural Hall, London, last month, attracted a very large number of entries in the classes in the Bread and Flour sections in which competitors were restricted to the use of National Mark flour. The prizewinners in the Bread Class 59 (115 entries), for the best 2-lb. All-English commercial tin loaf made wholly from National Mark flour, were: (1) J. R. Irons, London; (2) W. C. Hurley, Chippenham; (3) W. E. Spencer, St. Albans. Prizes of twenty, ten and five guineas were given by the Ministry in this Class. Mr. Irons and Mr. Spencer also took first and second prizes, respectively, in Class 64 (64 entries) for the best 1-lb. All-English commercial milk loaf (tin) made from National Mark flour, in which the prizes were given by the National Farmers' Union. In the judging, all entries underwent a preliminary classification into three grades, and the long row of entries in Grade I for Class 59 provided an impressive demonstration of the possibilities of National Mark Yeoman flour for producing a really attractive commercial loaf. The prize-winning loaves were splendid examples of good volume and general appearance, pleasing

colour and close, even texture, while the whole entry showed a marked improvement on the standard reached last year.

In the British Wheat Flour Competitions, Class H was confined to authorized millers of National Mark wheat flour. In this Class, for flour complying with the standard of quality required for All-English (Yeoman) Wheat Flour packed under the National Mark, the Ministry offered gold, silver and bronze medals and diplomas. The winning competitors were:—

(1) Whitworth Bros., Victoria Mills, Wellingborough.
(2) Executors of Walter Green, Castle Flour Mills, Beccles.
(3) T. Burgess & Sons, Thornton Dale Mill, Pickering, Yorks.

In addition, the Ministry offered a gold medal to the farmer supplying the largest proportion of wheat used in the winning flour. This was gained by Mr. Ben Measures, of Hemington, Barnwell, near Oundle.

National Mark Flour Inter-County Cookery Competition.—No fewer than 24 County Federations of Women's Institutes entered for the National Mark Flour Inter-County Cookery Competition held at the Grocers' Exhibition, Royal Agricultural Hall, London, September 23–25. This competition, arranged under the joint auspices of the Ministry and the National Federation of Women's Institutes, followed a series of individual County Competitions held earlier in the year. Each County Federation was allowed to enter one team consisting of not less than seven Women's Institute members, and no individual member was allowed to prepare more than three exhibits. Seven sections were arranged, and each County Federation was permitted to send in three entries in each section. The sections, and the points scored for 1st, 2nd and 3rd place in each, were as follows :—

Section	*Description*	1*st* Points	2*nd* Points	3*rd* Points
1	Bread, cottage loaves	100	75	50
2	,, tin loaves	100	75	50
3	Scones, plain	70	50	35
4	,, currant or sultana ..	70	50	35
5	Cakes, plain	80	60	40
6	,, fruit	80	60	40
7	Pastry	80	60	40

The Ministry awarded a handsome silver plaque, specially prepared by the Royal Mint for the occasion, to the County Federation that secured the highest aggregate number of points. This was won by the West Kent County Federation with 220 points, Lancashire being second with 175 points, and East Kent and East Sussex tied for third place with 155 points.

The Ministry also awarded certificates to the County Federations that secured first, second and third place, respectively, in each section as follows :—

Section 1 : Devon, East Kent, West Kent.
„ 2 : Lancashire, Lancashire, West Kent.
„ 3 : Cambridgeshire, Oxfordshire, Cambridgeshire.
„ 4 : Shropshire, Gloucestershire, East Sussex.
„ 5 : West Kent, East Sussex, Essex.
„ 6 : East Kent, East Sussex, Essex.
„ 7 : East Suffolk, Isle of Wight, West Kent.

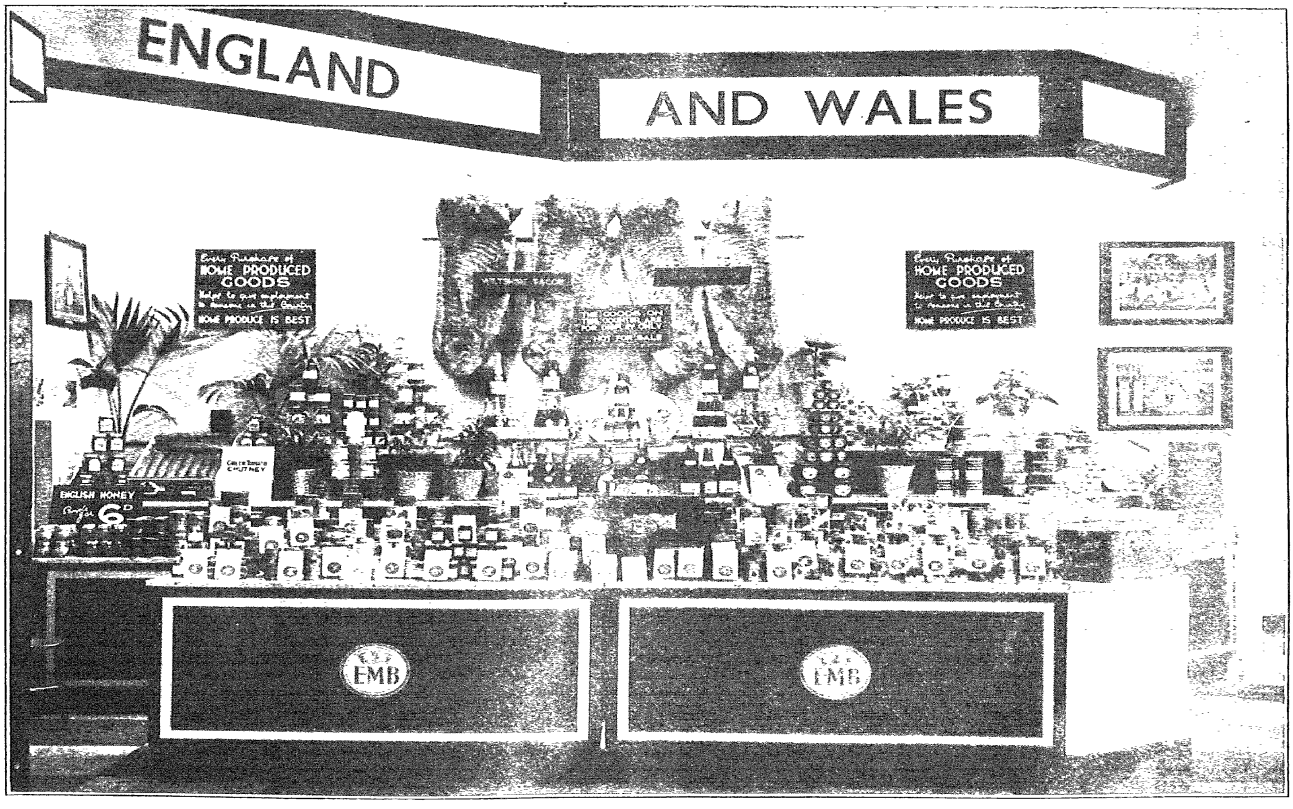
Both the Inter-County Competition and the individual County Competitions that preceded it aroused considerable enthusiasm, and they have undoubtedly been instrumental in stimulating the interest of the women of the countryside, not only in National Mark flour, but also in the National Mark scheme as a whole.

Displays of National Mark and other Home Produce.—As indicated in the September issue of this JOURNAL, the Ministry occupied the Empire Marketing Board shop at Palatine Buildings, The Promenade, Blackpool, for the fortnight August 31 to September 12, with a display of English and Welsh produce arranged in conjunction with the National Farmers' Union and other bodies. A photograph of this display is reproduced opposite. 20,507 samples of home produce to the value of £233 were sold to visitors to the shop, the most popular lines being canned fish, fruit, vegetables and milk, National Mark apples, Cheshire cheese, tomatoes and honey. A further fortnight's occupation for a display of National Mark products was commenced on September 28.

Displays of home produce were also staged at the Confectioners' and Bakers' Exhibition and the Grocers' Exhibition, the Royal Agricultural Hall, London, September 5 to 11, and September 19 to 25, respectively, and also at the Produce Exhibition at the Shire Hall, Worcester, on September 30, held by the Worcestershire Federation of Women's Institutes.

Marketing Demonstration.—A honey marketing demonstration was staged at the Home Crafts and Gardens Exhibition (National Show of Bees and Honey) at the Crystal Palace, September 9–12.

France : Proposed National Mark for Agricultural Products.—A Bill to create a " National Mark " for agricultural products intended chiefly for export has been tabled by the French Minister of Agriculture. The mark is designed to identify goods of French origin and to serve as a mark of quality.



Display of English and Welsh produce at the Empire Marketing Board shop, Blackpool. (*See page* 740.)

Schemes for the establishment of such marks have been successfully launched in several countries abroad, more especially since the National Mark was adopted in England and Wales, but a special feature of the French project is the proposal to grant subsidies and loans to interested agricultural organizations to facilitate the sale and distribution of agricultural products. In order to raise funds for this purpose, it is proposed to levy a special tax of 1½ per cent. *ad valorem* on imports and exports of agricultural products and foodstuffs, whether animal, vegetable or forestry.

Portugal : A National Mark for Olive Oil.—The Portuguese Government has passed a Decree adopting a national trade mark for olive oil intended for export. A Board has been appointed to authorize and regulate the use of the mark and to prescribe types of barrels, brand marks, qualities of oil and methods of packing.

The mark consists of a silhouette map of Portugal with a representation of the Portuguese coat of arms in the centre, around which are the words " Azeite de Portugal " (Olive Oil from Portugal).

The mark will be registered in foreign countries and permission to use it will be granted, on application, to exporters, producers, commercial concerns, co-operative societies, syndicates and other agricultural associations. The National Mark labels will be supplied by the Board and the proceeds from the sale of labels will be used to cover the Board's expenses.

Authorized packers will be permitted to use the National Mark for publicity purposes.

Provision is made for an inspection service and for penalties for illegal use of the mark.

Austrian Equalization Fund for Milk.*—Some time ago, an attempt was made in Austria to set up an equalization fund for milk, in order that producers who did not market their milk as fresh, but processed it in the country dairies, should be offered compensation for the reduced returns thus accruing to them. This attempt at a voluntary agreement broke down. Recent developments on the chief Austrian fresh milk market, Vienna, have made it imperative, in the opinion of the Government, to set up a market equalization fund, and the Ministry for Agriculture and Forestry has prepared a Bill providing for the establishment of such a fund. In the Bill it is laid down that " everyone purchasing cow's milk for sale, or selling it direct to consumers as fresh milk or sour milk, in a raw or cooked condition, with or without additions, or using it for the production of other foodstuffs than butter and

* Extracted from *Blätter für Landwirtschaftliche Marktforschung*, July, 1931.

cheese, or of industrial products," is required to contribute to the fund. The rate of contribution to the fund as at present proposed is to be 2 groschen per litre of milk ($\frac{2}{3}d.$ per gallon).

World Cures for the World's Economic Ills.—In an article lately published in the *New York Times*,* Mr. T. L. Chadbourne conceives the solution of the problem of constantly-recurring periods of over-production of staple commodities as lying in world commodity agreements of the kind recently completed for sugar†—known as the Chadbourne Plan—which the author was himself largely instrumental in negotiating. The following are extracts from Mr. Chadbourne's article :—

"The most encouraging thing about the present position is the increasing realization of the need for attacking world economic ills in a world-embracing manner. . . . To-day, inter-European or even international co-operation, in its limited expression, is not sufficient to meet the new challenge. We must have world-embracing economic arrangements, binding all the producing and exporting nations to an accord which will, so far as it is humanly possible, insure a more rhythmic flow of business and prevent the return of these 'inevitable' world depressions which are not inevitable at all."

"Inasmuch as the world crisis is attributable to the unhappy trilogy of over-production, accumulation and depression, it might be well to consider the manner in which we attacked the world sugar problem, one of the worst crises confronting any commodity and typical of present conditions. First, we segregated surplus world stocks for orderly marketing over a period of five years. Second, we placed a rigid restriction upon output in the chief exporting countries of the world so that future output, plus annual sales of segregated surpluses, will equal and not exceed consumption. Third, we secured governmental sanction to control the arrangements made, so that recalcitrants can have no opportunity to take advantage of their fellows."

"In the past, there has been, so far as I know, no thought given to the manufacture and marketing of sugar from the standpoint of the industry as a whole."

"The units (whether corporations, co-partnerships or individuals) engaged in manufacturing and marketing the product have been managed with varying degrees of efficiency, but, with rare exceptions, without co-operation among themselves even within national borders."

"A large percentage of the Java producers for many years co-operated wisely and successfully in the marketing of their output, but this did not save the island from serious over-production last year and a threatened repetition of over-production this year ; and Java producers, so far as I am aware, are the only instance of continuous joint selling by practically all the producers of any nation."

"Generally speaking, both production and marketing have been conducted the world over by the comparatively small units engaged in the business purely on a competitive basis."

"The old adage, 'Competition is the life of trade,' contains a half-truth than which there is nothing more dangerous, but recent develop-

* "World Cures for the World's Economic Ills" by T. L. Chadbourne, *New York Times*, June 7, 1931.

† See *Report on the Sugar Beet Industry at Home and Abroad*, Economic Series No. 27. H.M. Stationery Office.

ments in the commodity situation of the world indicate that unrestrained competition is likely to be the destruction of society and has opened the eyes of the business world to the necessity of at least tempering this worn-out statement by the addition of one word and making it read, in future, 'Enlightened competition is the life of trade.'"

"Enlightenment in a great industry is only obtainable by co-operation."

Marketing Organization and the Agricultural Crisis.—The Economic Committee of the League of Nations has recently published a Report on the Agricultural Crisis* which, *inter alia*, points to the need for marketing organization on a national and even an international scale as one means of improving the economic condition of farmers throughout the world. The Report states :—

"The discussions of the experts have thrown light on all the practical difficulties in the way of applying a general programme for reducing agricultural production. But it would perhaps not be impossible to influence production indirectly by endeavouring to regulate the marketing of agricultural products." . . .

"Farmers are wondering whether it would not be better to consider, both in the national and in the international sphere, measures in harmony with the spirit of conscious organization which sometimes appears ready to assert itself in present-day economic life. They are aware of the disadvantages from which the sale of their products suffers as a result of the inadequate organization of agricultural markets. They are gradually coming to see the crisis as, to a considerable extent, the consequence of this failure. There is no doubt a crisis of production, but there is also a crisis of disorganization, a crisis in respect of the sale of agricultural products." . . .

"From whatever angle one approaches the agricultural problem, one is always and everywhere brought back to the problem of surpluses. If there were not quantities of wheat and wine larger than those for which the consumer is prepared to pay a remunerative price, there would be no grain problem or wine problem. The sufferings of the producer begin with the appearance of a surplus beyond the actual demand."

"In the division of markets and in the distribution to the consumers, forms of commercial organization have to be found which will make it possible to a certain extent to render these surpluses innocuous and to distribute them while leaving

* Official No. C. 239. M. 105. 1931, II.B. Geneva, June 15, 1931. Price 7*s.* 6*d.*

prices at a fair level. To regulate the sale of agricultural products alike on the home and on foreign markets, and to organize the national market and its relations with the foreign market by the aid of as exact information as possible with regard to the needs of the one and the resources of the other —in other words, to follow the example of the syndicates which have been formed in industry to contend with over-production and the depreciation of prices—such is to-day one of the essential preoccupations of agriculture."

The Report then proceeds to contrast the highly organized condition of manufacturing industry, with its system of sales agreements, cartels and trusts, by which it has been possible to define quotas of production and sale with the individualistic production and marketing methods of agriculture.

"A large number of countries are undoubtedly tending to organize the sale of their agricultural products in the direct interest of the producers, and this organization frequently takes the form of centralized supervision. Many governments are instigating or supporting the necessary action for the improvement of collective organizations for the sale of products or for the extension of markets. The purchase and sale of products through centralized organizations will enable, the Committee think, the conclusion of bargains on terms which are reasonable alike for the consumer and for the producer."

. . .

"Once set up, the national organizations for centralized action might come to an understanding with the similar organizations in neighbouring countries and in certain circumstances might unite with a view to international action." . . .

"Some experts consider that international agreements might be very helpful in this connexion. Just as recently in the case of sugar, agreements might be concluded, not directly limiting production, but regulating the distribution of particular exports in the international market. What has been found possible in the case of producers of sugar should be equally practicable for other commodities. The attempt, it is suggested, should be made by international agreement to restrict the flow of such products into the market and to establish quotas of the supply to correspond with the demand of the various countries, and to distribute the supply between the various markets which have hitherto been the prey of ruinous undercutting."

British Sugar Industry (Assistance) Regulations, 1931.—The Minister of Agriculture has made Rules governing the procedure

for the payment of advances, under the British Sugar Industry (Assistance) Act, 1931, in respect of sugar manufactured in Great Britain from home-grown beet during a period of one year commencing October 1, 1931. These Rules are published as Statutory Rules and Orders, and copies can be obtained through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

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NOTES ON PRICES AND SUPPLIES

R. J. THOMPSON, C.B., O.B.E.

Milk.—The drop in the milk contract prices for the ensuing year was not altogether unexpected, as several of the factors that bear upon the settlement seemed to indicate that a reduction would be unavoidable. The addition of 115,000 cows and heifers to the cow population of 1930 showed that more milk was likely to be available, while there was no sign of expansion in the demand, a fact that is, perhaps, not surprising when it is remembered that the retail price of milk has for some time been relatively much above the retail price of most other foods. In the winter of 1930, retail milk was about 80 per cent. and in the summer of 1931 about 60 per cent. above pre-war prices, whereas food generally, as shown by the Ministry of Labour's Index Number, only showed about one-half this increase, having declined in the course of the twelve months from 43 per cent. to 28 per cent. above the level of July, 1914. With unemployment and a general lack of prosperity among a large part of the population, the high price of milk must certainly have tended to restrict consumption, or at least have prevented any expansion.

Another factor in the present reduction has no doubt been the low prices obtainable on the average for butter, cheese and other milk products. The price obtainable for surplus milk—that is, milk surplus to the quantity that can be sold as liquid milk for human consumption—depends on the price of the products into which it can be converted: if these decline, the price of surplus milk must fall, and in time a drop in the price of the milk sold for liquid consumption is practically inevitable. In any case, cheaper surplus milk means a lower average price.

The new agreement is noteworthy for the fact that the prices to be paid in the winter months are almost at the same level as those for the summer months, whereas in all

previous agreements higher prices have always been paid in the winter, partly to encourage production and partly to meet higher feeding costs. As a corollary to this, the retail price is expected to remain at 6*d.* per quart throughout the twelve months, a return to the old practice of having a uniform price all the year round; this will benefit the consumer to the extent of 1*d.* per quart in the winter months, and his average price will only be 50 per cent. above pre-war rates instead of from 60 to 80 per cent. As regards the terms of the settlement, the average reduction in the case of holders of contracts coming under Class I and Class II (*a*) is 1¾*d.* per gallon on the declared quantity, or 12½ per cent. In the case of Class II (*b*), where there is no restriction as to quantity, 75 per cent. of the deliveries are to be paid for at the full rate as compared with 80 per cent. in last year's contract, the balance being allowed for at the manufacturing rate. The full rate in this class, allowing for the varying percentages in the different months, gives an average for the year of 1*s.* 0½*d.* per gallon as compared with an average of 1*s.* 2⅔*d.* in the 1930-1931 agreement. The manufacturing rate, which is based on the price of Canadian and New Zealand cheese, has worked out in the past year at less than 5*d.* per gallon, and the effect of this has been to make the average price of milk delivered in 1930-31 under contracts in Class II (*b*) 1*s.* 0½*d.* per gallon (*i.e.*, taking the portion paid for at the full rate and the portion paid for at the manufacturing rate together). The manufacturing price in the ensuing season 1931-32 cannot, of course, be foreseen, but if it should be approximately the same as last year, say 5*d.* per gallon, the average of all the milk sold under Class II (*b*) would work out at 10¾*d.* per gallon, or a reduction of 14 per cent.

Other Products.—Turning to the prices of other products, there are few favourable features to be recorded. As was to be expected, new-crop wheat has opened at exceptionally low rates, but barley is more promising and oats show little change. Fat cattle have fallen sharply, and sheep are cheaper, but pork pigs show a slight improvement, probably as a result of a better demand for pork, though the price of the latter is still low. Eggs are rising slowly. Potatoes, under the influence of poor crop prospects, are fetching slightly better rates than at this time last year.

Some comparative prices ruling a month ago and a year ago are given in the following table.

	Prices early in Sept., 1931	Aug., 1931	Sept., 1930
	s. d.	*s. d.*	*s. d.*
Wheat, Gazette average, per cwt. ..	4 9	6 6	7 3
Fat cattle, first quality, per cwt. ..	45 10	49 2	51 2
Beef, English N.M. Prime, per lb. ..	0 7½	0 8¼	0 8½
,, Argentine Chilled H.Q., per lb.	0 8	0 7¾	0 7
Fat sheep, first quality, per lb. ..	0 10¾	0 11½	1 1¾
Mutton, English, per lb.	0 10½	0 10¼	1 0¾
Lamb, New Zealand, per lb. ..	0 9	0 8	0 9½
Bacon pigs, first quality, per score..	10 8	10 10	15 0
Bacon, Danish green, per cwt. ..	70 0	80 0	98 0
Pork pigs, first quality, per score ..	12 6	12 1	17 1
Pork, English, per lb.	0 9	0 7¾	1 1
Cheese, New Zealand, per cwt. ..	64 6	65 0	78 0
,, Canadian, per cwt.	64 0	65 0	83 0
Eggs, N.M. Standard, per 120 ..	16 0	15 0	18 0
Potatoes, King Edward, Lincs and York, per ton	150 0	140 0	140 0
Wool, Southdown, per lb. at Bradford	1 0	1 0	1 4
Maize, Argentine, per cwt.	3 9	3 8	6 5

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending September 9, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

The close of the cereal year sees the index number of agricultural prices, in common with that of wholesale prices in general, at a lower point than has been recorded since the War. English agricultural produce, however, has not, on the average, experienced such a severe decline as commodities in general, the Ministry of Agriculture's Index Number for August still standing at 21 per cent. above pre-war prices, whereas the Board of Trade Index Number, which represents the wholesale prices of 150 commodities of all kinds, was one-half per cent. below the level of 1913. The drop during the past twelve months has also been less marked, the average for the cereal year being about 9 per cent. below 1929-30, whereas commodities in general have fallen by 16 per cent. Whilst the farmer has had to accept lower prices for his produce, there has been some compensation on the purchasing side: feeding stuffs, for example, have been 25 per cent. cheaper in 1930-31 than in 1929-30, while fertilizers could be bought at just about pre-war prices; plant, implements and machinery have also shared in the general fall in prices.

Wheat.—Weather conditions, both in Europe and North America, have been unfavourable for the wheat crop, but the extent to which the European crops have been damaged

is still uncertain. A provisional estimate issued by the International Institute of Agriculture indicates an out-turn for Europe (excluding Russia) of 1,400 million bushels as against 1,370 million bushels last year, and later reports support the view that, on the whole, production will be rather better than in 1930. Preliminary estimates for Germany, Italy and France—three important purchasing countries—all forecast larger crops.

According to the official report for the United States, the winter crop, which is much above normal, is expected to yield 775 million bushels, and the spring crop 111 million bushels, the latter figure being less than one-half the spring wheat crop of 1930. The Canadian spring crop, which, in the same way, has suffered greatly from bad climatic conditions, is estimated at 271 million bushels compared with 398 million bushels last year. The total North American crop is thus about 6½ per cent. smaller, but the reduction is overshadowed by the large stocks remaining from last season—mainly in the United States, though to an appreciable amount, also, in Canada. The stocks held by the American Farm Board have been reduced recently by contracts with Brazil, China and Germany amounting to 47½ million bushels, but it has to be borne in mind that these sales have the result of reducing the buying by these countries on the open market. Part of the remaining stocks may be regarded as non-effective for the current season, as they will no doubt be held over by the Farm Board into 1932-1933, but after making liberal allowance for this balance and for domestic consumption, it seems probable that the surplus available for export from the United States is fully equal to that of last year, and, taken in conjunction with Canada, the supply that can be provided from North America is more than ample.

No estimate of production is yet available for Russia, but early shipments have been on a substantial scale, the total in the first six weeks of the season amounting to 3,563,000 quarters as against 1,129,000 quarters in the same period last year. *The Corn Trade News* provisionally estimates the probable exports from Russia at 15 million quarters as compared with 12 million last year, but this figure may have to be reduced.

The reduction in the area sown in Argentina—to be harvested next December—which has been previously mentioned, is now confirmed, the estimated sowings this season being 17,043,000 acres or about 4,300,000 acres less than last year.

The general position in the middle of September was much the same as a month earlier, viz., a limited demand met by ample offerings, with the result that prices have again declined somewhat. The Liverpool October future, which in the middle of July stood at 4*s*. 1⅛*d*. per 100 lb. dropped to 3*s*. 11*d*. in August and to 3*s*. 9¾*d*. in September. New crop English wheat was only fetching about 20*s*. per 504 lb. As was pointed out in these notes last month, there is a possibility that prices will improve as the season advances, and those growers who can hold their grain should avoid selling at the present time.

Cattle.—The tendency of fat cattle prices during the past month has been decidedly downwards, average first quality having fallen from 49*s*. 2*d*. to 45*s*. 10*d*. per live cwt. This has not apparently been due to any special influx of supplies, such as may be expected in October and November, but to a lack of finish in the stock on offer; this feature, which is usual in the autumn, seems to be showing early this year, owing no doubt to the unfavourable weather. A consequence of this lack of quality is seen in the fact that Argentine chilled hindquarters have for several weeks been from ¼*d*. to ½*d*. per lb. dearer on the London market than National Mark Prime Beef. Imports of chilled meat from the River Plate were somewhat lighter in August than for some months past, and shipments also show a reduction.

Sheep.—Prices of fat sheep usually show a seasonal tendency with a spring maximum and an autumn minimum, the highest point occurring in April and May, after which a decline ensues to October followed by a gradual recovery till the following spring. During the past season, however, the spring rise, though not entirely absent, was very slight and of very short duration. In May, 1930, first quality Downs and Cross-breds averaged 1*s*. 3*d*. per lb. dead weight and then dropped steadily till the following March when they stood at 1*s*. 0½*d*. per lb. For a few weeks in April and May, prices ranged from 1*s*. 0½*d*. to 1*s*. 1*d*. per lb., after which the downward tendency was resumed and, early in September this year, the average only stood at 10¾*d*. per lb. as compared with 1*s*. 1¾*d*. per lb. a year earlier. Whilst falling prices have been characteristic of all live stock, it seems probable that the depression in fat sheep prices has been much accentuated by the heavy imports of frozen lamb that took place in the early part of the year, when prices are usually at their best. The increase in imports

is shown in the following table, based on the monthly figures issued by the Imported Meat Trade Association :—

NUMBER OF LAMB CARCASSES IMPORTED IN THE FIVE MONTHS JANUARY TO MAY

	1930	1931
Australia	1,006,000	1,149,000
New Zealand	3,281,000	3,911,000
River Plate	2,480,000	3,173,000
	6,767,000	8,233,000

This represents an increase of 22 per cent., of which a substantial part came from New Zealand, the most direct competitor with English mutton. As a result of these heavy receipts, New Zealand and other kinds of imported lamb were depressed for several months, prime Canterbury lamb being quoted by the Imported Meat Trade Association in April as low as $6\frac{3}{8}d.$ per lb. or just about $2d.$ per lb. less than in 1930. As imports became more moderate, values gradually improved and, early in September, this grade was realizing wholesale $8\frac{5}{8}d.$ per lb. or only $\frac{1}{8}d.$ per lb. less than at the same time last year. The new season in New Zealand does not open till November, and lamb does not begin to arrive in quantity till January or February, so that, for the present, heavy competition from this source has ceased.

Exports next season may show some reduction, as the total number of sheep and lambs in New Zealand has decreased from 30,841,000 in 1930 to 29,585,000 in 1931, though the latter figure is still above preceding years. It will be noticed that there was a heavy increase also in lamb received from Argentina. Carcasses from this source usually fetch lower prices than those from New Zealand, but they form a large item in the total supply and are also important because they begin to arrive in quantity before the New Zealand consignments, being quite large from November to January. *The Review of the River Plate* anticipates that the forthcoming season's kill will not be much below last season's figures, and remarks that the production of early lambs for export is said to be one of the most profitable branches of the pastoral industry in Argentina.

Recent exchange rates have favoured sellers of these and other products in the Southern Hemisphere, as the £ sterling has been approximately 27*s.* in Argentina, 26*s.* in Australia, and 22*s.* in New Zealand.

Pigs, Pork and Bacon.—Pork has improved in price, first quality on the London market during the first two weeks of September realizing 9*d.* and 9½*d.* per lb., whereas during the previous three months it has ranged from 7½*d.* to 8¼*d.* per lb. Rates are, however, still much below last year. Pork pigs showed a slight tendency upward, and were about 6*d.* per score higher than a month ago, but bacon pigs were a trifle lower. Imports of bacon continue at the high level of recent months, receipts in August amounting to 951,000 cwt. as compared with 757,000 cwt. in August, 1930, while the total for the eight months has amounted to 7,296,000 cwt., or over 26 per cent. above the same period last year. Prices, after being somewhat firmer, have again weakened in response to a smaller demand.

Butter.—Imports of butter in August were lower than they have been for several months past, owing chiefly to the somewhat smaller end-of-the-season receipts from the Southern Hemisphere, the total receipts amounting to 658,000 cwt. as compared with 808,000 cwt. in the preceding month and 544,000 cwt. in August, 1930. Imports are now rather below the present consumptive demand, and there is an outward movement from stocks of butter in store, this being likely to continue until about December, when the new season's imports from Australia, New Zealand and Argentina again become large.

The quantity of butter in store is slightly less than at this time last year, the figures on September 11 amounting to 921,000 boxes as compared with 968,000 boxes at the same date in 1930. The gradings of butter in Australia continue to be heavy, while in New Zealand the receipts into store are also higher. Conditions for production are believed to be favourable, and large supplies from these two countries may be expected in the forthcoming season. Prices of imported butter, though fluctuating, remain definitely below those of last year, New Zealand salted, first quality, in London early in September, being 117*s.* against 132*s.* per cwt., while Danish stood at about 128*s.* as compared with 152*s.* in 1930. With present stocks and supplies in prospect no permanent improvement in the market seems likely.

Cheese.—At the Cheese Fairs, Cheddar has recently been realizing much lower prices than last year, second quality ranging from 64*s.* 6*d.* to 66*s.* per cwt. whereas 83*s.* to 86*s.*

was obtainable in the same period in 1930. New Zealand and Canadian sorts remain proportionately low, although in neither case have imports been large of late. From New Zealand only 295,000 cwt. were received during June, July and August as against 448,000 cwt. in the same months last year, and, as receipts into store in New Zealand are on a small scale, the reduction in supply may be maintained for the present.

Prices have been somewhat firmer, first quality ranging since the middle of July from 64*s*. 6*d*. to 66*s*. per cwt., an improvement of 5*s*. to 10*s*. per cwt. on earlier rates, but still some 15*s*. below the same period last year. As regards Canadian cheese, indications suggest that imports will be on about the same scale as last year or possibly even less. Cheshire cheese, though it does not show as much decline as Cheddar, seems to be about ½*d*. to 1*d*. per lb. cheaper. The explanation of present low prices is probably to be found in a lack of demand, caused by the relative cheapness of other foods, but, as supplies are moderate, there is some chance of an improvement.

Potatoes.—The potato area this year is returned at 447,000 acres or 22,000 acres more than the exceptionally small area of last year. Present indications are for an average yield of about 5½ tons, which would result in a total production of 2,458,000 tons, as compared with an output of 2,743,000 tons in 1930. If this is confirmed, it will be the lowest yield recorded for many years, the nearest recent figure being obtained in 1924 when the output was estimated at 2,696,000 tons. When production, as in this case, is on the low side, prices tend to advance as the season progresses, while, when the crop is large, the reverse is the case ; supplies are then continuously pressed on the market and prices tend to decline. For example, the years 1925-26, 1928-29 and 1929-30 were years of heavy crops and declining prices, while the years 1926-7, 1927-8 and 1930-31 were years of relatively small crops and advancing prices.

The present year should, therefore, be a season of rising prices with a high general average. On the last occasion when there was a small crop, though not so small as the probable yield this year, the average grower's price at Wisbech f.o.r. was £8 per ton. It often happens, however, in years of short crops, that prices early in the season are disproportionately low compared with those obtainable later, owing to supplies being freely marketed before the size of the crop is fully appreciated. Such may prove to be the case this year,

as prices at Wisbech in the middle of September for King Edward potatoes were only 100*s.* to 110*s.* per ton, or very little more than was obtainable at the same date last season with a much better crop. Growers would probably be well advised to restrict deliveries in the next month or two.

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OCTOBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
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Systems of Farming.—The principle on which the conduct of arable farming is based is well illustrated in the four-course rotation, in which each crop is either a preparation for the next or a crop of particular value deriving benefit from the previous crop. A root or cleaning crop or bare fallow is succeeded by a cereal that provides an opportunity to sow seeds of clovers and grasses, which in turn provide a hay crop that is also a preparation for a cereal crop. The arable area is thus half under stock foods and half under cereals that may or may not be used for stock. When cereals had a cash value higher than their stock feeding value the aim was to concentrate on cereal growing and to use the crops that were primarily stock foods, like roots and hay, to feed stock that would tread straw into manure to be used to make good the loss of fertility arising from the sale of cereals. In typical arable areas stock as a direct source of profit was secondary to the growth and sale of cereals, principally wheat and barley. In the west and north stock are more important than cereals, and greater attention has been paid to their revenue-earning capacity than to their manure-making properties. One section of farmers consisted of stock raisers and another section of stock fatteners and cereal growers. When cereals were grown at a profit both sections benefited. In recent years, cereals have been low in price and stock have been relatively more profitable. If farmers in this country must rely to a greater extent on live stock and live stock products, the system of cropping must be modified and farming arrangements altered. There are districts and especially individual farms where such changes are admittedly difficult, and mean much expense in alterations to buildings and in fencing and watering fields. Modifications have been going on for years; indeed, except for the upheaval in farming matters caused by the War, the last half century has been a

time of change in which live stock have increased in importance as compared with cereal production.

Over large areas, low prices for cereals have benefited the farmer, inasmuch as the price of feeding stuffs is lower also under such conditions.

The farmer has been characterized as conservative in his methods. In the writer's view this is an unfair accusation. The English farmer is ready to follow a remunerative branch of the industry, but changes often require fresh capital which is not always available, and such a condition is too often the real cause of uneconomic methods being continued too long. Moreover, certain methods may be profitable as long as the market for a particular product is not overstocked. Market garden products are noted examples, and the present position of the liquid milk market is not such as to encourage any great extension in this direction. Much of the arable land recently or soon to be converted to pasture may be devoted to raising cattle and grass sheep. Such practices must be accompanied by reduced costs.

On a farm known to the writer there were up to within quite recent years two tractors and ten or twelve horses at work, and 12 regular men were employed. Now the whole farm is in grass, sheep are the only stock and only 2 men are employed. What a difference to the adjoining village! There is no use for the blacksmith or wheelwright, and whereas local tradesmen formerly drew from this one farm practically the whole of the wages of 12 men for goods and services, they now draw from only two.

Such a doleful tale may seem to be rather remote from the activities of the month on the farm, but County Agricultural Organizers are in very intimate touch with these changes, and whilst they realize their economic necessity under certain conditions—if the land is to be utilized at all—and give active assistance to the farmer in carrying them out, they cannot help feeling that the rural community suffers. The prime necessity of the period is a reduction in the unit cost of the production of crops and stock.

As in the instance quoted above, reduction of cost appears to be possible only by adopting an extensive or ranching type of farming, but in other circumstances, and particularly on the best land, reduced cost may be attained by more intensive production. The factor that is brought out clearly in recently published surveys is the importance of a high output per worker.

Cereals after Ley.—The four-course rotation is admirably adapted for the growth of wheat, which normally follows a clover ley. Clover adds to the nitrogen in the soil and leaves the soil in a good physical condition, with that firmness which is so beneficial to the young wheat. In a dry autumn ploughing of the ley ground is sometimes difficult, and many farmers are of opinion that wheat does not succeed so well when the leys are ploughed in a dry and hard condition as when more moist conditions are prevalent. Where rye-grass has been sown with the clovers the conditions for wheat growing are less satisfactory, due in some measure to a lower nitrogen content, but also apparently to some extent to the nature of the rye-grass roots, which take longer to decay and give up their manurial contents. Many farmers have expressed the opinion that rye-grasses produced some substance that was injurious to wheat. Experiments on this problem in West Sussex, where pure Italian rye-grass was used as the "seeds" crop, have indicated that, provided the seed-bed is firm enough, the adverse influence of rye-grass on the wheat plant during winter can be largely overcome. Such a seed-bed is best obtained when the ley is ploughed under moist conditions and is furrow pressed.

Additions of nitrogenous manures in autumn gave indecisive results when sulphate of ammonia or nitro-chalk were used at the time of seeding, but calcium cyanamide applied ten days before sowing the seed was distinctly beneficial. When the leys were ploughed under dry and hard conditions the results were inferior.

The spring and summer growth after pure rye-grass was poor and required dressings of up to 2 cwt. nitro-chalk per acre to secure the growth obtained after a pure clover ley.

If such rye-grass leys are ploughed during winter they are well suited for the growth of spring oats, and usually admit of earlier sowing and a better chance of success than land that has grown roots. This has led some farmers to try winter oats instead of wheat as the cereal to follow a ley with a large proportion of rye-grass. These attempts have shown that oats are affected just as adversely as wheat, and that unless a moist firm seed-bed is obtained the result will be a disappointment. Where a rotation of two- or three-year leys is practised a good preparation for autumn cereals is to plough the ley in June or July after the removal of a hay crop, and submit it to a short bastard fallow. The objection to such a procedure is that wheat sometimes suffers from an attack of wheat bulb

fly after bare fallow, particularly on the medium and lighter class of soils. On the whole there is a good deal to be said in favour of spring-sown oats as the best crop after short leys.

Root Crops.—Root crops that require to be stored take up much time on the farm this month. There should be no delay in lifting potatoes, and the prevalence of disease in many districts adds to the urgency of the work. Careful sorting should be done before the potatoes are stored, and if forecasting is indulged in the prospects would appear to favour those who can keep potatoes in good condition till later in the season.

Mangolds and sugar beet are also crops that can be got out of the ground this month. In the south the season has been wet, cool and rather sunless, and such conditions do not produce good quality roots or roots that keep well. It is not likely that sugar beet will require to be stored this year, as the smaller acreage should be readily handled by the factories during the ordinary lifting period.

Mangolds are late in maturing, and this may interfere with their keeping properties. In such circumstances the clamps should not be too big, and it is important to ensure that they are well ventilated. It is risky to delay the lifting of mangolds too late because they are immature. Such roots are more easily damaged by frost, and if the dry matter is lower than usual, as is generally expected, the dangers of frost are greater.

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NOTES ON MANURES

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Information on Manures and Manuring.—At this time of the year, farmers will be considering their cropping and manurial schemes for the coming season. Most of them will make their decisions entirely by the light of their own local knowledge and observations accumulated over a series of years. There is, however, a considerable body of outside information that can be brought to bear on these questions. It can seldom be used in the exact form in which it is received, but much of it may be adopted and modified to suit the particular circumstances in view. It may be of interest to set down some of the more important sources from which farmers can amplify their own experience in regard to fertilizer practice.

Good farming and wide reading seldom go together, but the weekly agricultural papers are, as a rule, carefully studied and contain much information of a practical kind relating to

the use of fertilizers. The current prices of the standard manures are given regularly and there are occasional articles dealing with the results of experiments and examples of successful practice. Similar information of particular local interest is frequently to be found in the agricultural columns of the local press. Further material, treated as a rule from the general standpoint, is to be found in the Leaflets issued by the Ministry, while the more local applications are illustrated and discussed in the reports of the county agricultural colleges or farm institutes. Personal advice and discussion on technical matters are of more value than pointed recommendations, particularly if the adviser makes a visit to the farm. Advice of such character is available first from the county agricultural organizers and their staffs, who have the great advantage of being in the position to adjust the standard knowledge of fertilizers in relation to a wide and varied local experience; and, second, from the district advisers of the large organizations producing or importing artificial manures. Lectures dealing with the use of fertilizers are also arranged by farmers' organizations, the questions and discussions following the lectures being, usually, the more important part of the proceedings.

Much can be learned by visits to other farms; that of the local agricultural college or farm institute will naturally be of immediate interest because of the experience of local problems and conditions. Here farmers have the opportunity of seeing the results of experiments which would in most cases be too costly or troublesome to carry out themselves. Successful schemes of manuring, demonstrated on the growing crops, may often be adopted almost without change. The basic principles underlying the use of fertilizers are best brought out at the older experimental farms such as Rothamsted, Woburn, and others. Here the continued use of various combinations of manures over long periods have brought out their special effect on the crops, and on the soil, in a most striking way, and those who derive little from reading tables of yields cannot fail to see the broad results in the crops themselves. At these stations, also, farmers can get in touch with the finer part of fertilizer practice, and the means adopted for investigating them with the necessary precision. Most of those who visit experimental stations, or read the reports of field trials, would consider them with a great deal more attention had they been carried out on their own farms, and it will be agreed that the results of experiments on the farm itself form the best guide to practice. Much can be done to

settle the outstanding manurial requirements of soil and crop by simple trial strips where the results are obtained by observation, without upsetting the working of the farm. For smaller effects more ambitious arrangements are required.

A considerable volume of well-conducted experimental work is already being done for farmers' guidance on private farms on the Continent—and, indeed, at the farmers' expense. In this country, it is at present exceptional for a farmer to conduct on his own land an experiment that can bring out anything but large differences.

Those who are undertaking more precise experiments are usually working in co-operation with the field staffs of research stations or agricultural colleges. It is highly desirable that this should continue on a wider scale in order to provide information of direct importance to the farmer himself and to extend the basis of advisory work.

Autumn Manuring.—By far the greater part of the artificial fertilizers used on the arable land are applied in spring. The root crop which, in its various forms, is more generously manured than any other, is not sown before April, and experience has shown that it derives good benefit from artificials applied partly in the seed bed and partly top-dressed; while the nitrogenous fertilizers and, particularly, the more active ones, have been shown to suffer considerable losses in the drainage water from land that is not carrying an actively-growing crop during cold wet periods. We can assume, therefore, that no artificials will ordinarily be used in autumn for spring-sown crops, although there may be circumstances in which the case for an autumn application of phosphate or potash would be worth examination. The less-soluble phosphates, such as steamed bone-flour, low-soluble basic slag or ground-rock phosphates, might be more effective for barley or roots if applied in autumn, and, in continental practice, potassic fertilizers are sometimes used in this way. Accurate experiments on these points have not, up to the present, been carried out in this country.

We are left, therefore, with autumn-sown cereals, beans and vetches. Here again, direct experimental evidence on the relative merits of autumn or spring dressings is scanty, but, since potash and phosphate are not subject to loss by leaching, and both are required in the early life of the plant, the usual practice of applying these manures before sowing has much to recommend it. The case of nitrogen is different;

it is not required for the leguminous crops, and, since cereals are usually taken on land in reasonably good condition following seeds or roots, and nitrate formation in the soil is active in early autumn, there will usually be sufficient nitrogen available to establish the plant before winter sets in. Excessive leaf-growth is of no advantage at this time of the year, and, if weeds are present, they would derive at least as much benefit from the addition of nitrogen as would the corn crop.

A light dressing of about 2 cwt. superphosphate or high-soluble basic slag will be justified for autumn-sown crops when the previous crop has not received phosphate. On relatively few soils will this be necessary if the seeds and roots have been well supplied with phosphate. Compared with root crops, the potash requirements of cereals are small, and under ordinary good farming conditions, where dung is used in rotation, winter cereals should need little help in this direction. The exception would be found on sandy or chalky soils on which the previous crop had not received dung or other potash manures; $1\frac{1}{2}$ cwt. of 30 per cent. potash salts would form a reasonable dressing for such conditions. The leguminous crops are more responsive to potash than the cereals and may be somewhat generously treated. If artificials are relatively little used in autumn, dung, on the other hand, is commonly applied at this season for wheat, potatoes and sugar beet, and, as far as its plant food is concerned, the above remarks hold good. A certain loss of active nitrogen must be reckoned with in wet mild winters, but, in the drier parts of the country, this is offset by the convenience of getting the manure out at this time. In any case, some loss may be avoided by spreading the heaps at once and ploughing in the dung without delay. The cost of a dressing of good farmyard manure is considerable, and it should be applied to those crops, such as potatoes, sugar beet and young seeds, that derive most benefit from it, leaving the cereals, as a rule, to be grown with artificials.

Loss of Chalk from the Soil.—The fact that the chalk supply of the soil undergoes a slow process of exhaustion is generally recognized. The various sources of loss and their approximate amounts are somewhat as follows. The most serious removal of chalk from the surface soil takes place in the drainage water. This action is persistent, and ultimately leads to the complete disappearance of both the natural and artificially-built-up reserves of carbonate of lime. The extent of this loss,

expressed in hundredweights of chalk per acre per annum, varies considerably. It is greatest where the amount of carbonate in the surface soil is high, as in the chalky soils, or in soils that have been very heavily chalked in recent times, such as the clay loams overlying the chalk in the south-east of England. On soils poorer in carbonate, it is less. Observations made on the Rothamsted plots put the figure as high as 9 cwt. of calcium carbonate per acre per annum. Under ordinary conditions, the amount is put at 3 or 4 cwt., while a German estimate is 5 cwt. When the chalk has all gone, the loss of lime by weathering from the soil minerals is much smaller, and Prof. Hendrick has shown it to be of the order of $\frac{3}{4}$ cwt. in the granitic soil of Craibstone, although other bases besides lime are washed out in fair quantity.

A further but less serious loss of chalk occurs by the removal of the cultivated crops. The amount of lime (CaO) contained in average crops, although varying considerably with the amount of chalk present in the soil, is approximately as follows :—

Cereals, grain and straw ..	13 lb. per acre
Potatoes, tubers and haulm..	45 ,, ,, ,,
Sugar-beet roots and tops ..	108 ,, ,, ,,
Meadow hay	72 ,, ,, ,,
Lucerne hay	207 ,, ,, ,,

The farm does not lose the whole of this lime, for the greater proportion is contained in the straw and leaves, which are usually fed ; and, although the livestock retain some lime to produce bone and milk, there is a residue that is returned to the land through the farmyard manure, which contains about 11 lb. CaO per ton.

There is further a loss associated with the use of certain artificial fertilizers—in particular with sulphate of ammonia. This only becomes of account if the lime supply is at a very low ebb, when the continued use of sulphate or muriate of ammonia makes matters worse and hastens the onset of definitely acid conditions. It is estimated that sulphate of ammonia removes from the soil approximately its own weight of chalk or half its weight of lime (CaO).

On the other side of the balance sheet, there are certain small gains of lime, but none of them comparable in amount with the gain by chalking or liming at ordinary agricultural rates. A few artificial fertilizers contain small amounts of lime, or substances equivalent to it, in their ultimate effect. This is the case with cyanamide, 60 per cent. CaO equivalent, and basic slag, about 30 per cent. CaO equivalent. The

amount brought in by purchased feeding stuffs is negligible. Linseed cake, for example, contains about 9 lb. per ton. On the whole, the losses greatly outweigh the gains, and, since a small reserve of lime is highly beneficial to the agricultural qualities of soils, it is essential to take steps to see that exhaustion does not proceed to a point when cropping or cultivation begin to suffer.

PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended September 16				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	7 18	7 18	7 18	7 18	10 2
,, ,, Granulated (N. 16%)	*	7 18	7 18	7 18	7 18	9 10
Nitro-chalk (N. 15½%) ..	*	6 0*d*	6 0*d*	6 0*d*	6 0*d*	7 9
Sulphate of ammonia :—						
Neutral (N. 20·6%).. ..	*	5 10*d*	5 10*d*	5 10*d*	5 10*d*	5 4
Calcium cyanamide (N. 20·6%)	*	6 5*e*	6 5*e*	6 5*e*	6 5*e*	6 1
Kainit (Pot. 14%)	§	2 15*h*	2 12	2 11	2 16*g*	4 0
Potash salts (Pot. 30%) ..	§	4 7*h*	4 5	4 5	4 6*g*	2 11
,, (Pot. 20%) ..	§	3 3*h*	3 0	2 19	3 4*g*	3 2
Muriate of potash (Pot. 50%)..	§	8 11*h*	8 7	8 4	8 11*g*	3 5
Sulphate ,, (Pot. 48%)..	§	10 9*h*	10 3	10 3	10 8*g*	4 4
Basic slag (P.A. 15¾%)‖ ..	§	2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..	§	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%)	§	3 11	..	3 9	2 15*k*	3 5
,, (S.P.A.13¾%)	§	3 5	2 15	3 3	2 10*k*	3 8
Bone meal (N.3¾%, P.A.20½%)	§	8 15	7 10	7 0	6 10	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	5 5*f*	6 0	4 15	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra and for lots of 2 tons and under 4 tons 5s. per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails 2*s.* 6*d.* extra.

h Prices are ex ship; for delivery from store, Kainit and potash salts are 6s., and muriate and sulphate, 10s. per ton extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

NOTES ON FEEDING

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Feeding Stuffs for Winter.—In most areas the month of October brings the necessity for putting into practice some part of the winter standards in stock feeding. In good grassland districts, however, it has been shown that grass, if fairly abundant in October, is sufficient for more than the mere maintenance of dairy cows and fattening cattle. Even on indifferent pastures, the grass, supplemented with good hay, or with good hay and cabbages or kale, will be sufficient for maintenance and the production of an appreciable number of gallons of milk. Just how many gallons of milk such feeding will produce will depend on the conditions as determined both by the nature of the land and the thriftiness of the particular breed or strain of cows. It is possible that recommendations regarding the feeding of concentrates for a definite number of gallons of milk have, in recent years, tended to become a little too hard and fast. The skilled practitioner, however, can readily adapt such recommendations to his particular requirements, and possibly the best service that the advisory scientist can offer to him is simply to draw attention to those concentrated foods which, if he requires any at all, he will find most economical for his particular purposes.

At current prices home-grown cereals, with the exception of malting barley, will generally pay better to feed than to sell. For feeding to dairy cows, oats, barley and wheat require to be supplemented with some protein-rich food in order to secure the proper balance. The richer the food is in protein the less of it will be required. Roughly 1 lb. of such a food as decorticated ground nut cake or meal, or soya bean cake or meal, will be sufficient to balance about 3 lb. of cereals. Palm kernel cake, maize gluten feed, undecorticated cotton cake, and beans will balance just about their own weight of cereals. If the farmer intends to use as much of his own cereals as possible he will require to buy less if he purchases one of the foods that is richest in protein. The artificial feeding stuffs mentioned above are those that offer best value at the present time.

Undecorticated cotton cake has been criticized for use in winter feeding. It is true that it has a binding effect, and it has been blamed for causing retention of the afterbirth or "cleanse" in cows, when it has been fed to them in liberal

quantity immediately before calving. The decisive criticism against cotton cake in recent years, however, was on grounds of economy. It was expensive when judged on its composition and feeding value in relation to its price per ton. Its price, however, has now fallen appreciably, and cotton cake can be placed amongst the relatively cheaper feeding stuffs on the market meanwhile. Cotton cake has always had its supporters, and no doubt, when fed in conjunction with heavy rations of roots, its deleterious effects are largely counteracted. It should, however, be remembered that it is a comparatively low-grade food, 1 lb. of cotton cake being but little higher in starch equivalent than 1 lb. of first-class hay, although it is more than double as rich in protein.

In regard to any fattening cattle, on grass, that have ceased to make sufficient daily live-weight increase, or are failing to develop or maintain the desired "bloom," the grass could very well be supplemented with hay, or if that is insufficient, with hay and cereals plus a small proportion of linseed cake. It is recognized that no known feeding stuff secures so readily that "bloom" of coat and skin that linseed cake rarely fails to produce. An alternative as regards the concentrated portion of the feeding is a combination of palm kernel cake and maize germ cubes or maize germ cake. If it is desired to counteract scouring and good hay is not available or is not readily consumed in sufficient quantity to secure this desired effect, a feeding mixture that has been found useful is equal parts of cotton cake and kibbled maize or maize meal.

It is sound policy to feed 1 to 2 lb. of linseed cake, per head per day, to young cattle likely to be affected with husk in these months. Where the linseed cake tends to cause scouring it could be fed along with cotton cake and flaked maize—say 2 parts linseed cake, 1 part cotton cake, and 1 part flaked maize or maize meal or barley meal; alternatively equal parts of linseed cake and crushed oats. Lawson has recommended that food of this sort given to young stock out of doors is best fed about 9 a.m.

Husk is likely to be prevalent in all classes of stock this autumn after the abnormally wet season that has been experienced. Not only younger cattle, but lambs, and pigs kept on the out-door system, are likely to be affected. The inclusion of linseed cake in the rations of these different classes of young stock should help to some extent to counteract the unthriftiness that arises from this troublesome disease. Where out-door pigs are being fed on cubes or dry meal, the

linseed cake in kibbled form can conveniently be added to the ration at the rate of ¼ lb. to ½ lb. per head.

Grinding of Cereals and Hay.—With regard to the preparation of cereals for stock feeding, the use of certain hammer mills enables cereals to be ground up into very fine meals of a type specially well suited for stock. Oats may be ground sufficiently fine to permit of the meal being fed satisfactorily to pigs. Home-grown clover and lucerne may also be converted into meal of a standard of fineness comparable to that of commercial alfalfa (lucerne) meal, which is sold on the market at a relatively high price.

These hammer mills are unfortunately rather too expensive to justify their installation at the present time on small or medium-sized farms. They may be driven by tractors or electric motors, but for the larger types necessary to turn out an appreciable quantity of meal per hour, trial has indicated that upwards of 20 h.p. is certainly preferable. In view of the desirability of using as efficiently as possible home-grown cereals, hay and lucerne, in stock feeding, hammer mills would appear to have an important future, and should repay the attention of progressive stock keepers, more especially those who are farming on a fairly big scale. Alfalfa or lucerne meal is very largely used by poultry-keepers, and it is of some importance to note that, by means of a hammer mill, meal of suitable fineness can readily be made on the farm from home-grown lucerne.

Potatoes for Pigs.—It is to be expected that, during the coming winter, potatoes that fail to reach the standard for sale for human consumption will be used pretty largely for stock feeding. In this country such potatoes are usually fed to pigs. On the whole they form a wholesome food, but may contain certain acrid substances that act as irritants causing scouring. Potatoes also ferment readily and give rise to gas after being consumed. In order to counteract any such harmful effects it is best to cook potatoes when they are fed in quantity to pigs, more especially to pigs not yet adult. Sows in pig, and well grown gilts, on range, may be given as much as 16 lb. of raw potatoes per head per day without harmful effect. For younger pigs, however, and particularly those confined to sties or other buildings, potatoes are better cooked. Roughly 4 lb. of potatoes are generally taken as equivalent in feeding value to 1 lb. of barley meal.

An experiment carried out in Denmark provides interesting data showing to what extent potatoes may be included in the ration of pigs being fed for bacon, and the effect of different percentages on rate of growth, and the ultimate quality of the carcass. Pens of pigs were fed either without potatoes or on rations including potatoes to supply 10, 20, 30 and 40 per cent. respectively of the food for each lot. The basal ration consisted of cereal meals and separated milk, which is one of the most commonly employed rations for the production of bacon pigs in Scandinavia.

Experiment with Cooked Potatoes

Lot No.	1	2	3	4	5
Percentage cooked potatoes (approx.)	0	10	20	30	40
Daily increase in grammes	677	679	680	677	651
Age in days at 89 kg. weight	181	181	180	181	184
Food units per kg. of increase	3·90	3·89	3·94	3·89	3·83
Percentage loss on slaughter	24·8		25·8		26·1
Percentage export bacon and ham	61·9		61·3		60·8
Thickness of the back fat	4·3		4·2		4·1
Points for firmness of flesh	12·5		12·8		12·8

It will be seen from these figures that as much as 40 per cent of the ration may be in the form of potatoes without the fattening period being seriously prolonged, and without increasing the number of food units required to produce 1 kg. of live-weight increase. Further, the quality of the carcass has not been adversely affected as judged by firmness of flesh. The percentage loss on slaughter is rather more, probably owing to the pigs being hardly as "prime," or well finished, as those fed on the more highly concentrated rations. The variation in this respect, however, is not great, and the figures serve to show that farmers who may have on hand potatoes unfit for sale, but yet sufficiently sound to be fed to stock, can use them in high proportion in the ration for fattening pigs, if the starchy nature of the potatoes is balanced with separated milk or with some concentrated food to supply the necessary amount of protein. The common protein-rich foods employed in pig feeding are fish meal, meat meal, blood meal, soya bean meal, etc. Provided that the pigs are suitably bred for bacon production, and do not belong to those breeds that are naturally liable to produce soft carcasses with an excess of fat, a large percentage of potatoes in the ration need not produce carcasses of low grade, but can yield high-grade carcasses suitable for bacon curing.

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	4 15	0 8	4 7	72	1 3	0·67	9·6
Barley, Canadian No. 3 Western	18 9	400	5 5	0 7	4 18	71	1 5	0·76	6·2
„ Persian	18 3	„	5 2	0 7	4 15	71	1 4	0·71	6·2
„ Russian	17 9	„	5 0	0 7	4 13	71	1 4	0·71	6·2
Oats, English, white	—	—	6 7§	0 7	6 0	60	2 0	1·07	7·6
„ Canadian No. 2 Western	18 9	320	6 12	0 7	6 5	60	2 1	1·12	7·6
„ „ No. 3 „	17 6	„	6 2	0 7	5 15	60	1 11	1·03	7·6
„ „ Mixed Feed	11 0	„	3 17*	0 7	3 10	60	1 2	0·62	7·6
„ Argentine	13 9	„	4 16	0 7	4 9	60	1 6	0·80	7·6
„ Chilian tawny	14 9	„	5 3	0 7	4 16	60	1 7	0·85	7·6
„ „ white	20 9	„	7 5	0 7	6 18	60	2 4	1·25	7·6
„ Russian	16 6	„	5 15	0 7	5 8	60	1 10	0·98	7·6
Maize, Argentine	16 6	480	3 17	0 7	3 10	81	0 10	0·45	6·8
Peas, Indian	—	—	8 0†	0 14	7 6	69	2 1	1·12	18
„ Japanese	—	—	19 0†	0 14	18 6	69	5 4	2·86	18
Milling offals—									
Bran, British	—	—	4 17	0 16	4 1	42	1 11	1·03	10
„ broad	—	—	5 10	0 16	4 14	42	2 3	1·20	10
Middlings, fine, imported	—	—	5 15	0 12	5 3	69	1 6	0·80	12
„ coarse, British	—	—	5 15	0 12	5 3	58	1 9	0·94	11
Pollards, imported	—	—	4 10	0 16	3 14	60	1 3	0·67	11
Meal, barley	—	—	6 5	0 7	5 18	71	1 8	0·89	6·2
„ maize	—	—	4 15	0 7	4 8	81	1 1	0·58	6·8
„ „ germ	—	—	4 17	0 11	4 6	85	1 0	0·54	10
„ locust bean	—	—	5 5	0 5	5 0	71	1 5	0·76	3·6
„ bean	—	—	8 2	0 16	7 6	66	2 3	1·20	20
„ fish	—	—	16 10	2 7	14 3	53	5 4	2·86	48
Maize, cooked flaked	—	—	5 17	0 7	5 10	83	1 4	0·71	8·6
„ gluten feed	—	—	5 7	0 12	4 15	76	1 3	0·67	19
Linseed cake, English, 12% oil	—	—	8 5	0 19	7 6	74	2 0	1·07	25
„ „ „ 9% „	—	—	7 17	0 19	6 18	74	1 10	0·98	25
„ „ „ 8% „	—	—	7 12	0 19	6 13	74	1 10	0·98	25
Soya bean cake, 5½% oil	—	—	7 12*	1 7	6 5	69	1 10	0·98	36
Cottonseed cake—									
„ „ English, 4½% oil	—	—	4 10	0 19	3 11	42	1 8	0·89	17
„ „ Egyptian, 4½% „	—	—	4 0	0 19	3 1	42	1 5	0·76	17
Ground-nut cake, 6-7% oil	—	—	6 0*	0 18	5 2	57	1 9	0·94	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 5	1 6	5 19	73	1 8	0·89	41
Palm kernel cake, 4½-5½% oil	—	—	6 0§	0 11	5 9	75	1 5	0·76	17
„ „ „ meal 4½% „	—	—	6 10§	0 11	5 19	75	1 7	0·85	17
Palm kernel meal, 1-2% „	—	—	5 5	0 12	4 13	71	1 4	0·71	17
Feeding treacle	—	—	5 0	0 7	4 13	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	4 2	0 12	3 10	48	1 5	0·76	13
„ „ „ porter	—	—	3 12	0 12	3 0	48	1 3	0·67	13
Malt culms	—	—	4 10†	0 19	3 11	43	1 8	0·89	16
Dried sugar beet pulp (*a*)	—	—	3 15	0 6	3 9	65	1 1	0·58	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of August, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 12s. per ton as shown above, the food value per ton is £6 8s. Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1s. 10d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·98d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 5s. 4d.; P_2O_5, 3s. 3d.; K_2O, 2s. 11d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 2
Maize	81	6·8	3 17
Decorticated ground nut cake	73	41·0	7 5
„ cotton cake	71	34·0	7 0

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·15 shillings, and per unit protein equivalent, 1·86 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

Crops	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	5 1
Oats	60	7·6	4 3
Barley	71	6·2	4 13
Potatoes	18	0·6	1 2
Swedes	7	0·7	0 9
Mangolds	7	0·4	0 9
Beans	66	20·0	5 13
Good meadow hay	37	4·6	2 11
Good oat straw	20	0·9	1 5
Good clover hay	38	7·0	2 17
Vetch and oat silage	13	1·6	0 18
Barley straw	23	0·7	1 8
Wheat straw	13	0·1	0 15
Bean straw	23	1·7	1 9

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. Price 6*d*. net.

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MISCELLANEOUS NOTES

A Course in Tropical Agriculture

As a considerable proportion of students from Seale-Hayne Agricultural College ultimately engage in agricultural pursuits overseas, and frequently in the Tropics, it has been decided that, commencing with the autumn term this year, a course of twenty lectures shall be given from October to April. The hours of these will be arranged so as to enable students following other courses to attend, and a nominal fee of £1 will be charged for each person taking the course, to cover the cost of lantern slides. The course begins on October 12.

The subjects of the lectures will be as follows: 1.—Geographical features and products of tropical countries; 2.—Climate; 3.—Soils; 4.—Natural vegetation; 5.—Irrigation, Drainage and Erosion; 6.—Systems of Agriculture; 7.—Cotton; 8.—Tea; 9.—Cocoa and Coffee; 10.—Sugar Cane, Millet and Maize; 11.—Oil Seeds and Oil Palms; 12.—Rubber, Sisal and Jute; 13.—Rice and Cassava; 14.—Tobacco and Cinchona; 15.—Date Palm and Coconuts; 16.—Citrus Fruits, Bananas and Pineapples; 17—19.—Diseases of Europeans and Natives; 20.—Livestock in the Tropics.

Further information may be obtained on application to the Principal, Seale-Hayne Agricultural College, Newton Abbot, Devon.

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Rothamsted Winter Lectures

ARRANGEMENTS made by Sir John Russell, the Director of the Rothamsted Experimental Station, will permit Mr. H. V. Garner, the Guide-Demonstrator of the Station, and other members of the Staff, to give, during the coming winter, a few lectures on the Rothamsted experiments to Chambers of Agriculture and Horticulture, Farmers' Clubs, Farm Workers' Associations, Agricultural Societies, etc.

The subjects for lectures, with the names of the respective lecturers, are given below. From this list, a choice may be made, and the Station will endeavour to arrange for the selected lecture, or lectures, to be given on a date, or dates, that will be convenient to the society concerned. It should be noted that it is only possible to deal with one subject in a single lecture, and that as much notice as possible should be given to the Station.

No fee is charged for the lectures, but societies are expected to defray lecturers' travelling and hotel expenses, and to make all necessary arrangements for the holding of the lectures. All communications upon the subject should be addressed to the *Secretary, Rothamsted Experimental Station, Harpenden, Herts.*

LECTURES BY Mr. H. V. GARNER, M.A., B.Sc. (*Guide-Demonstrator*)
(1) Some principles of manuring and their application on the farm.
(2) The use of fertilizers on grass land.
(3) Recent experiments with sugar beet.
(4) The manuring of potatoes.
(5) The use of cheap nitrogen.
(6) Some results of the Rothamsted experiments on commercial farms.
(7) Experience with the newer fertilizers.

OTHER LECTURES

(1) *Soil Micro-Organisms* (*Bacteria, Protozoa, etc.*)

Lucerne Inoculation	Dr. H. G. Thornton, B.A.
Life in the Soil	Mr. D. W. Cutler, M.A.
Biological Aspects of Partial Sterilization	Mr. D. W. Cutler, M.A.

(2) *Agricultural Botany*

Weeds of Farm Land and Methods of Control	Dr. Winifred E. Brenchley, F.L.S.
Eradication of Farm Weeds by Spraying with Chemicals and Manures	Dr. Winifred E. Brenchley, F.L.S.

(3) *Agricultural Chemistry*

Liming and Chalking	Dr. E. M. Crowther, F.I.C.
Recent developments in the production and use of fertilizers	Dr. E. M. Crowther, F.I.C.
Basic slags and other phosphatic fertilizers	Dr. H. L. Richardson.

(4) *Soil Physics*

Soil Acidity: its cause and control	Dr. R. K. Schofield.
Science and Soil Cultivation	Mr. G. W. Scott Blair.

(5) *Entomology*

Insect Pests	Dr. H. F. Barnes, B.A.
Bee Keeping	Mr. D. M. T. Morland, M.A.

(6) *Mycology*

Plant Diseases: their Causes and Control	Dr. W. B. Brierley, F.L.S.
Soil Fungi and Plant Growth	Dr. W. B. Brierley, F.L.S.
Fungous Diseases of Crops	Dr. W. B. Brierley, F.L.S.
Virus Diseases of Plants	Dr. J. Henderson Smith, B.A. Dr. J. Caldwell, M.A.
Plant Diseases: their Causes and Control	Mr. R. H. Stoughton, B.Sc.
Bacterial Diseases of Crops	Mr. R. H. Stoughton, B.Sc.

Special Research Grants

THE following special research grants have been renewed for the academic year, commencing on October 1, 1931, on the recommendation of the Advisory Committee on Agricultural Science.

Institution	*Investigation*	*Amount* S = Salary E = Expenses £	*Investigator(s)*
Cambridge University, Department of Animal Pathology.	Use of B.C.G. Vaccine.	E. 500	Professor J. B. Buxton and Dr. A. S. Griffith.
Cambridge University, School of Agriculture.	Effects of Stubble Cleaning.	S. 300 E. 30	W. A. Jones.
Oxford University, School of Rural Economy.	Apple Mildew.	E. 40	Dr. R. C. Woodward.
Do.	Breeding of Oats for Resistance to Frit Fly.	E. 247	Dr. N. Cunliffe.
Reading University.	Solids-not-fat in Milk.	S. 250 E. 130	M. N. Nicholson and C. E. Lesser.
Seale-Hayne Agricultural College.	Broccoli Breeding.	E. 130	F. R. Horne.
Wye, South-Eastern Agricultural College.	Struck and Gangrene Diseases of Sheep on Romney Marsh.	E. 350	A. D. McEwen and R. S. Roberts.

* * * * * *

Post-Graduate Agricultural Scholarships

On the recommendation of the Advisory Committee on Agricultural Science, post-graduate Agricultural scholarships have been awarded as follows :—

A. Teaching Scholarships :—

Name	*Subject*
TWO-YEAR SCHOLARSHIPS	
D. S. Edwards	Animal Husbandry
R. B. Ferro	Crop Husbandry
A. L. Jolly	Agricultural Economics
ONE-YEAR SCHOLARSHIPS	
F. Bennett	Animal Husbandry
Miss M. Morrison	Dairying
B. K. Randall	Horticulture

B. Research Scholarships :—

THREE-YEAR SCHOLARSHIPS

K. Mather	Plant Genetics
A. R. Wilson	Mycology
P. S. Watts	Veterinary Science

ONE-YEAR SCHOLARSHIPS

Miss P. M. Edmunds..	Dairy Bacteriology
R. Melville	Plant Physiology

The following arrangements have been made for scholars to study abroad in the academic year 1931-32 :—

A. Teaching Scholars :—

Scholar	*Subject*	*Centre of Study*
F. Bennett ..	Animal Husbandry ..	Minnesota University, U.S.A.
Miss M. Morrison	Dairying	Denmark.
B. K. Randall ..	Horticulture	California University, U.S.A.
E. L. Jones ..	Agricultural Economics	Cornell University, U.S.A.
R. W. R. Miller ..	Crop Husbandry ..	Plant Research Station, Palmerston North, New Zealand, and Waite Agricultural Research Institute, South Australia.

B. Research Scholars :—

Scholar	*Subject*	*Centre of Study*
A. J. Pugh ..	Soil Chemistry	New Jersey Experiment Station, New Brunswick, U.S.A.
G. L. Hey ..	Entomology	Centres in U.S.A. and Canada.
W. F. Jepson ..	Entomology	Biologische Reichsanstalt, Berlin-Dahlem.

The agricultural scholarships are usually tenable for two and the research scholarships for three years. The second or third year, as the case may be, is usually spent abroad. The value of each scholarship is £200 per annum ; extra grants for travelling and maintenance are made in the case of scholars sent abroad. Scholar's fees are also paid.

* * * * * *

The Agricultural Index Number

ON average, prices of agricultural produce during August were unchanged as compared with July at 21 per cent. above 1911-13 ; potatoes were considerably cheaper, while fat pigs also were reduced, but the consequent declines in the relative index numbers were offset by advances in the figures for grain and milk. At the corresponding period a year ago, the general index number rose by one point to 35 per cent. above pre-war.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August..	49	42	44	52	35	21
September	55	43	44	52	42	—
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Values for wheat appreciated a little during August and the index number was 2 points higher on the month at 21 per cent. below the level of 1911-13. The marketing of small quantities of new crop barley at some centres, mostly in the Eastern Counties, resulted in a higher average price, as is customary at this period of the year. The average for August rose by 1*s.* 6*d.* to 7*s.* 7*d.* per cwt. and the index number by 19 points to precisely the pre-war figure. Oats became cheaper during the month under review, but as the extent of the fall was proportionately less than that which occurred in the base years, the index was 4 points higher at 8 per cent. below 1911-13.

Live Stock.—The index numbers for fat cattle and sheep were unaltered as compared with July, although in the case of cattle a slight reduction in price was recorded. Both bacon and pork pigs were cheaper and both index figures declined by 5 points. Baconers are now selling at 5 per cent. below pre-war, while porkers are only 5 per cent. above. Values for dairy cows and store cattle were a little lower and the index for the former declined by 2 points to 25 per cent. above the level of the base years. Store sheep were substantially reduced in price, and the index figure showed a drop of 13 points to 40 per cent. over pre-war. Store pigs were little altered either in price or index number.

Dairy and Poultry Produce.—The contract price of milk during August was a little higher than in July in some districts, and the index figure rose by 3 points to 55 per cent. above pre-war. Butter also was a little dearer, but the index number showed no alteration at 10 per cent. in excess of 1911-13.

Cheese was reduced in price, and the August level was 23 per cent. above that of the base years. Eggs continued to follow the upward course usual at this time of the year, but as the advance recorded in August was less marked than in 1911-13, the index declined by 2 points to 17 per cent. above pre-war. At the corresponding period of 1930, eggs were 40 per cent. dearer than in 1911-13. The index figure for poultry was 13 points lower at 31 per cent. in excess of the base level.

Other Commodities.—Quotations for first early potatoes were fully £4 per ton lower on the month, and the index fell by 34 points to 45 per cent. above pre-war, at which figure, however, it was 20 points higher than in August, 1930. Hay was again rather cheaper, but as the reduction in clover hay was proportionately less than that recorded in the base years, the index for this description rose by 2 points. Wool prices showed a slight recovery from the low levels ruling in June and July. Apples were much dearer than at the corresponding period a year ago, while prices of plums were about 100 per cent. higher.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	Aug.	Aug.	May	June	July	Aug.
Wheat	46	4	—28*	—24*	—23*	—21*
Barley	31	—12*	—10*	—9*	—19*	Nil.
Oats	30	—13*	—11*	—10*	—12*	—8*
Fat cattle	36	37	19	23	29	29
„ sheep	59	62	40	45	38	38
Bacon pigs	60	41	21	11	Nil.	—5*
Pork „	60	50	33	20	10	5
Dairy cows	35	35	24	23	27	25
Store cattle	19	30	25	28	31	31
„ sheep	64	66	28	45	53	40
„ pigs	85	112	52	41	31	32
Eggs	59	40	7	2	19	17
Poultry	47	43	63	52	44	31
Milk	93	58	47	48	52	55
Butter	48	33	8	7	10	10
Cheese	62	28	22	25	28	23
Potatoes	2	25	85	100	79	45
Hay	41	15	—10*	—11*	—13*	—12*
Wool	47	—5*	—21*	—32*	—34*	—31*

* Decrease.

* * * * * *

Enforcement of Minimum Rates of Wages.—During the month ending September 14, legal proceedings were instituted against 11 employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Cambridge ..	Ely	—	1 19 0	14 16 0	3
Derby ..	Ashbourne ..	—	—	20 0 0	2
Essex ..	Stansted ..	Case dismissed.			
Gloucester ..	Cirencester ..	20 0 0	—	*	4
Middlesex ..	Uxbridge ..	—	4 10 0	9 11 6	4
Nottingham .	Bingham ..	1 0 0	0 10 0	33 2 5	2
Stafford ..	Cheadle ..	0 5 0	—	5 12 0	1
,, ..	,, ..	0 5 0	—	5 10 0	1
,, ..	,, ..	1 0 0	—	20 10 2	2
,, ..	Leek ..	†	0 8 0	10 2 10	1
,, ..	,, ..	1 0 0	—	4 0 0	1
		£23 10 0	£7 7 0	£123 4 11	22

* Amount of arrears to be agreed.
† Dismissed under the Probation of Offenders Act.

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Foot-and-Mouth Disease.—Since the note published in the last (September) issue of this JOURNAL was written, thirteen outbreaks of foot-and-mouth disease have been found to exist in Pembrokeshire, Caermarthenshire, Bedfordshire and Huntingdon.

There are now two separate infected areas in Great Britain; one in England, in the county of Bedford and neighbourhood, and the other in Wales, in Pembrokeshire, Caermarthenshire and Cardiganshire.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Lincoln, Holland: Miss E. BROWN has been appointed Manageress of the County Egg-Laying Trials.

Salop: Miss M. G. SPURR has been appointed Assistant Instructress in Poultry-Keeping, *vice* Miss B. A. M. CHAMBERLIN.

Somerset: Mr. A. MURCHIE, B.Sc., N.D.A., N.D.D., has been appointed Assistant County Agricultural Organizer, *vice* Mr. D. J. G. BLACK, B.Sc.

COUNTY AGRICULTURAL EDUCATION STAFFS : WALES

Merioneth: Mr. ELLIS E. WILLIAMS, B.Sc. (Agric.), has been appointed Assistant Agricultural Organizer.

Caernarvon: Mr. H. R. Jenkins, N.D.P., has been appointed Poultry Instructor.

Glamorgan: Mr. ELWYN O. JAMES, B.Sc. (Agric.), has been appointed Instructor in Agriculture.

PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

Royal Agricultural College, Cirencester

Mr. GEORGE REDINGTON, M.Sc. (Leeds), D.Sc. (Aberdeen), has been appointed Lecturer in Agricultural Botany, *vice* Mr. G. P. L. MILES, B.Sc. (London).

STAFFS OF AGRICULTURAL RESEARCH INSTITUTES

The following changes and corrections have to be recorded :—

Imperial College of Science and Technology

(*a*) RESEARCH INSTITUTE IN PLANT PHYSIOLOGY

Mr. F. G. GREGORY, D.Sc., has been appointed *Assistant Director*.

(*b*) BIOLOGICAL FIELD STATION

A Biological Field Station for stored products research has been established at Slough, Bucks., and the following staff appointed :—

Director	Professor J. W. MUNRO, M.A., D.Sc.
Entomologists	Miss M. J. NORRIS, B.Sc.
	Miss D. I. MAKOWER, B.A.
	G. H. MANSBRIDGE, B.A.
	H. H. S. BOVINGDON, B.Sc., A.R.C.S.
	C. POTTER, B.Sc.
Mycologists	R. H. BUNTING, F.L.S.
	F. R. PASSMORE.
Chemist	A. B. P. PAGE, Ph.D., A.R.C.S.

Royal Veterinary College, London

RESEARCH INSTITUTE IN ANIMAL PATHOLOGY

Mr. A. D. MCEWEN has resigned his appointment.

London School of Hygiene and Tropical Medicine

INSTITUTE OF AGRICULTURAL PARASITOLOGY

Miss M. TRIFFITT, M.Sc., has been appointed to the staff of the Institute as *Field Officer*.

Dr. T. W. M. CAMERON has resigned his appointment.

John Innes Horticultural Institution

The following additional assistants have been appointed :

Breeding and Genetics	A. A. MOFFETT, B.Sc.
	J. PHILP, B.Sc., and
	F. W. SANSOME, Ph.D.
Entomology	A. W. MCKENNY HUGHES.

Dr. L. NEWTON, Mr. C. L. HUSKINS and Mr. PHILLIS have resigned their appointments.

University of Cambridge

The following additional appointments have been made :—

(*a*) ANIMAL NUTRITION RESEARCH INSTITUTE

Senior Assistants	A. WALTON, Ph.D., University Demonstrator in Agricultural Physiology (Physiology).
	M. S. PEASE, M.A. (Small Animal Breeding) transferred from the Small Animal Breeding Institute.
Assistants	Miss E. M. CRUICKSHANK, B.Sc., Ph.D. (Poultry Nutrition).
	R. E. EVANS, M.Sc. (Chemistry).
Veterinary Adviser.	W. A. WOOD, C.B.E., M.A., M.R.C.V.S.

(*b*) INSTITUTE OF ANIMAL PATHOLOGY

Protozoologist	G. LAPAGE, M.B., Ch.B., M.Sc.
Pathologist	J. A. NICHOLSON, M.A., M.R.C.V.S.
Assistant Helminthologist	W. A. WOOD, C.B.E., M.A., M.R.C.V.S.

Assistant Pathologist	.. ..	H. R. ALLEN, M.R.C.V.S.
Assistant Biochemist	.. ..	G. D. SHEARER, B.Sc.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE

Mr. E. G. THOMPSON, M.A., is the *Assistant* to the Manager of Field Plots.

University of Oxford

(*a*) AGRICULTURAL ECONOMICS RESEARCH INSTITUTE

Mr. D. SKILBECK has now left the Institute.

Mr. J. P. MAXTON, M.A., B.Sc., and Mr. K. A. H. MURRAY, B.Sc., D.Phil., have been appointed to the staff of the Institute.

(*b*) INSTITUTE OF AGRICULTURAL ENGINEERING

The following appointments have been made :—

Director	H. J. DENHAM, M.A., D.Sc.
Deputy Director	S. J. WRIGHT, B.A.
Assistants	J. E. NEWMAN, A.M.I.E.E. (Mechanical Engineering)
	C. A. CAMERON BROWN, B.Sc., A.M.I.E.E. (Electrical Engineering)

University of Bristol

(*a*) LONG ASHTON FRUIT RESEARCH STATION

Mr. J. G. MAYNARD has resigned his appointment.

Miss M. L. ADAMS has been transferred from the Fruit and Vegetable Preservation Research Station.

The following additional staff has been appointed :—

Chemistry	F. C. LEWIS, B.Sc.
Fruit Products	V. L. S. CHARLEY, B.Sc.
Biochemistry	J. O. JONES, M.Sc.
Plant Physiology	J. G. HINTON, Ph.D.
	Miss E. S. SMYTH, B.Sc., Ph.D.

University College of Wales, Aberystwyth

WELSH PLANT BREEDING STATION

The following additional staff has been appointed :—

Plant Breeding and Genetics ..	A. R. BEDDOWS, B.Sc., and R. A. SILOW, B.Sc.
Agronomy	W. E. J. MILTON, N.D.A.
Officer in Charge of Seed Production	G. EVANS, B.Sc.
Officer in Charge of Trials with Sheep	LL. IORWERTH JONES, B.Sc.
Plant Physiologist	H. G. CHIPPINDALE, M.Sc.

Rothamsted Experimental Station

Mr. H. SANDON, Mr. P. H. H. GRAY and Dr. J. WISHART have resigned their appointments.

The following additions have been made to the staff :—

Heads of Department : Fermentation	E. H. RICHARDS, B.Sc., F.I.C.
Assistant Physicist	E. W. RUSSELL, B.A.
Assistant Mycologist	Miss MARY D. GLYNNE, M.Sc.
Assistant Bacteriologist	H. NICOL, M.Sc.
Physiologists	J. CALDWELL, B.Sc., Ph.D.
	D. J. WATSON, B.A.
Assistant Entomologist	Miss M. A. HAMILTON, Ph.D.
Assistant Cytologist	Miss F. M. L. SHEFFIELD, M.Sc., Ph.D.
Assistant Physicist	R. K. SCHOFIELD, M.A., Ph.D.

Experimental and Research Station, Cheshunt, Herts

The following additions have been made to the staff of the station :—

Chemist	W. READ, M.Sc., A.I.C.
Mycologist	G. C. AINSWORTH, B.Sc.
Extension Officer	O. ORCHARD.

Horticultural Research Station, East Malling, Kent

The following additions have been made to the staff of the station :—

Pomology	W. S. ROGERS, M.A.
Statistics	T. N. HOBLYN (Hort. Dip. Wye).
Pathology	R. V. HARRIS, B.Sc., A.R.C.Sc.
Plant Physiology	M. C. VYVYAN, M.A.
Entomology	W. S. STEER, B.A.
Biochemistry	W. A. ROACH, B.Sc., D.I.C., L.I.C., A.R.C.Sc.
Technical Assistant	N. B. BAGENAL, B.A.

Ministry of Agriculture and Fisheries

(*a*) VETERINARY LABORATORY, WEYBRIDGE, SURREY

The following changes of staff have taken place :—

Divisional Veterinary Inspector, Diagnosis Department	T. BANNATYNE, M.R.C.V.S., D.V.S.M. *vice* W. WATT.
Veterinary Inspector, Vaccine Department	H. M. DUFF, M.R.C.V.S., *vice* L. E. PERKINS.
Poultry Disease Diagnosis	W. B. BLOUNT, M.R.C.V.S., *vice* N. S. BARRON.

(*b*) PLANT PATHOLOGICAL LABORATORY, HARPENDEN, HERTS.

The following assistants have been appointed :—

A. S. BUCKHURST, A.R.C.S., D.I.C., C. T. GIMINGHAM, B.Sc., F.I.C., W. C. MOORE, M.A., and A. SMITH, B.Sc., M.A., Ph.D.

Imperial Bureau of Entomology

PARASITE LABORATORY, FARNHAM ROYAL, BUCKS

The following staff have been appointed :—

Entomologists	G. SALT, D.Sc.
	H. T. ROSENBURG.
Botanist	A. S. WATT, Ph.D.
Field Agents	P. DE RIPPAS.
	S. KOZLOVSKY.

CHADACRE AGRICULTURAL INSTITUTE

The following changes are notified :—

Mr. E. KAYLER has been appointed Third Master, *vice* Mr. P. W. L. HOOK.

Mr. L. P. CANDLER, A.C.A., has been appointed Secretary and Accountant, *vice* Mr. P. L. LEIGH-BREESE.

* * * * * *

NOTICES OF BOOKS

The Physical Properties of the Soil. By Dr. Bernard A. Keen. Pp. vi ; 380. Illus. *The Rothamsted Monographs on Agricultural Science.* (London : Longmans, Green & Co. 1931. Price 21*s.* net.)

This study, which is the work of the Assistant Director of Rothamsted Experimental Station, is provided with a general historical introduction which clearly shows the relation between the development of methods of mechanical cultivation and the growth of the knowledge of soil

science, and this subject is dealt with in its modern aspects in a later chapter on soil factors bearing on cultivation. The relation of soil science and methods of cultivation has, of course, been realized by practical farmers and theoretical writers for a very long time, but it is only with the development of modern knowledge of the nature of the soil, and of mechanics, that a practical application of the two factors can be made. Naturally, the earlier farmers did in some measure modify their implements in order to suit the different characters of the soil they were working, but any evolution that took place was empirical rather than based upon accurate scientific knowledge.

Following the historical introduction, the writer proceeds to discuss the development of methods of mechanical analysis of the soil from the time of a comparatively simple analysis until the clarification of the subject in very recent years. The influence of water and air contained in the soil and in contact with the soil is discussed at length, as well as the influence of soil temperatures, and it is not too much to say that the book forms a complete survey of the present state of existing knowledge on the subject. The work of Dr. Keen has already formed the subject of contributions to scientific and agricultural periodicals, and will be sufficiently well known to readers of this JOURNAL. It is, therefore, almost superfluous to recommend this work, since it will clearly be required by all workers on the subject; it will, however, also prove of interest and value to landowners, large farmers and manufacturers of agricultural machinery.

Dairying Farming in the Blackmore Vale. By G. B. Bisset; M.Sc., B.Sc. (Agric.), C. Pringle, N.D.D., C.D.A. (Armstrong), and Edgar Thomas, B.Litt., B.Sc. (Reading: The University; Department of Agricultural Economics. Survey Studies No. 1. Price 1*s*.)

This is a comprehensive and interesting survey of farming conditions during the year 1929 in the Sturminster district of North Dorset, in which 91 per cent. of the total area is under permanent pasture, dairying being the major enterprise.

It is interesting to note that whilst there has been a considerable decrease in the number of cheese-making farms in recent years, the average net return from the milk-selling farms is lower than that from the farms engaged in cheese-making. Tables are given comparing the results obtained by family farming "where no charge is made for labour" with the returns from farms employing labour. These tables clearly indicate why family farming still holds its own.

The survey emphasizes the importance of proper organization in farming operations.

The Welsh Journal of Agriculture. Vol. VII. Pp. 431. (Cardiff: University of Wales Press Board. Price 2*s*. 6*d*.; 4*s*. in cloth.)

This journal appears annually under the auspices of the Welsh Agricultural Education Conference, which is convened by the Ministry's Welsh Secretary. The present issue contains a large number of articles dealing with various aspects of agricultural science and practice, some of which possess considerable interest for farmers far beyond the limits of the Principality. As might be expected in a Welsh agricultural publication, sheep, pasture and dairying are the principal subjects of discussion. Professor A. W. Ashby, of University College, Aberystwyth, contributes a paper, entitled "Does the Higher Farming Pay?" which is particularly opportune at a time when many are advocating a reduction in the standard of farming, or of output, in order that profits may be maintained. The final section consists of useful abstracts and reviews of the more important books on agriculture published during 1930.

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

Notable Farming Enterprises : I. (Sir F. Hiam's Fenland Farms ; Mr. G. Baylis's Downland Arable Farming ; Mr. W. T. Hayr's Leicestershire Grazing Farm). *H. G. Robinson.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 20-39.) [63.191.]

George Baylis and the Implications of his System of Farming. *C. S. Orwin.* (Agric. Prog., VIII (1931), pp. 51-56.) [63.191.]

Agriculture in Shropshire. *E. Druce.* (Agric. Prog., VIII (1931), pp. 34-37.) [63(42).]

Agriculture in Warwickshire. *W. Irons.* (Agric. Prog., VIII (1931), pp. 38-44.) [63(42).]

Agriculture in Warwickshire. *W. Irons.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 39-49.) [63.42.]

Statutory Small Holdings in Cheshire. *R. Douglas Wright.* (Jour. Brit. Dairy Farmers' Assoc., XLIII (1931), pp. 66-80.) [333.38 (42) ; 347.]

The Problem of Poor Light Land. *A. W. Oldershaw.* (Agric. Prog., VIII (1931), pp. 61-65.) [63.192.]

Agricultural Surveys (continued). (1) Two parishes in Sutherlandshire. (2) Parish in Argyllshire. (Scottish Jour. Agric., XIV, 2 (April, 1931) pp. 147-166.) [63(41).]

Labour Costs on Two Aberdeenshire Farms. *A. D. Imper.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 199-203.) [338.1 (41) ; 338.58 ; 331 (41).]

Reclamation and Cultivation of Peat Land in Lewis. Part II. *W. G. Ogg, J. Garst* and *A. Macleod.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 131-140.) [63.12 ; 63.142.]

The Scottish Plough Team in History. *J. A. S. Watson.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 140-146.) [63(09) ; 63.6.]

A Note on Seed Drills. *F. Rayns.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 109-120.) [63.17 ; 63.196 ; 63.31.]

The Biological Decomposition of Plant Materials, Part IV. The Biochemical Activities on Straws of some Cellulose-decomposing Fungi. *A. Geoffrey Norman.* (Ann. App. Biol., XVIII, 2 (May, 1931), pp. 244-259.) [576.8.]

Agricultural Economics

Adjustment of Production in Agriculture. *V. Christgau.* (Jour. Farm. Econ., XIII, 1 (Jan., 1931), pp. 1-8.) [338.1.]

The Wheat Quota. *E. A. Ruggles Brise.* (Jour. Farmers' Club, 1931, Part 3 (April) ; pp. 35-57.) [338.99.]

Official and Unofficial Statistics of International Trade in Wheat and Flour. (Wheat Studies, VII, 5 (March, 1931), pp. 267-293.) [63.311 : 31 ; 664.6.]

Wool Co-operative Movement in Yorkshire. *R. B. Colton-Fox.* (Jour. Yorks. Agric. Soc., 1931, pp. 66-68.) [334(42) ; 63.761.]

Agricultural Education

College and Institute Farms. *J. G. Stewart.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 2-19.) [37(42) ; 37(072) ; 374.9.]

The Training of Women for Country Life. Craibstone School of Rural Domestic Science. *A. M'Callum.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 125-130.) [376 ; 376.3.]

Some Aspects of Poultry Education. *R. T. Parkhurst.* (Agric. Prog., VIII (1931), pp. 121-124.) [37 : 6365.]

Agricultural Education in New Zealand. *A. W. G. Lipscomb.* (Agric. Prog., VIII (1931), pp. 125-128.) [37(931).]

Agricultural Research

The Influence of Systematic Plot Arrangement upon the Estimate of Error in Field Experiments. *O. Tedin.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 191-208.) [37(01).]

Studies in Sampling Technique: Cereal Experiments. I. Field Technique. *A. R. Clapham.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 366-371.) [37(01); 63.31.]

Studies in Sampling Technique: Cereal Experiments. II: A Small Scale Threshing and Winnowing Machine. *T. Wake Simpson.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 372-375.) [37(01); 63.31.]

Studies in Sampling Technique: Cereal Experiments. III: Results and Discussion. *A. R. Clapham.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 376-390.) [37(01); 63.31.]

Soils

On the Influence of Soil Temperature on the Germination Interval of Crops. *J. O. Irwin.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 241-250.) [551.5; 63.1951; 63.3.]

The Neubauer and Mitscherlich Methods of Soil Examination. *R. Stewart.* (Agric. Prog., VIII (1931), pp. 132-133.) [63.113.]

The Hydrochloric Acid Extraction of the Soil. Method provisionally adopted by the Association. *J. Hendrick.* (Agric. Prog., VIII (1931), pp. 134-135.) [63.113.]

Effect of Hydrogen Peroxide on Soil Organic Matter. *W. McLean.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 251-261.) [63.113.]

The Effects of Varied Dressings of Ground Limestone in the Field. *H. H. Nicholson.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 262-266.) [63.15.]

The Sticky Point Water of Soils. *B. de C. Marchand.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 324-336.) [63.112.]

A Comparison of Methods for Determining the Hydrogen-Ion Concentration of Soils. *R. J. Best.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 337-365.) [63.113.]

Fertilizers and Manures

Field Experimental Work in the Use of Fertilizers. *J. Porter.* (Agric. Prog., VIII (1931), pp. 57-58.) [63.16; 63.162.]

Conservation and Availability of the Nitrogen in Farm Manure. *A. F. Heck.* (Soil Sci., XXXI, 5 (May, 1931), pp. 335-359.) [63.163.]

Study of the Losses of Fertilizing Constituents from Cattle Dung during Storage and a Method for their Control. *N. D. Vyas.* (Agric. and Live Stock in India, I, 1 (Jan., 1931), pp. 34-43.) [63.163.]

Field Crops

Nitrogen Top-Dressing of Wheat. Experiment with Various Forms of Fertilizer at Different Times of Application, Season, 1929-30. *A. Y. Montgomery.* (New Zealand Jour. Agric., 42, 3 (March 20, 1931), pp. 185-192.) [63.311.]

An Experiment in the Seeding of Barley. *F. Rayns.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 98-109.) [63.31; 63.313.]

Yield Studies in Oats. IV.: The Influence of Climatic Factors upon the Growth of a Spring Sown Variety, "Record." *M. A. H. Tincker* and *Martin G. Jones.* (Ann. App. Biol., XVIII, 2 (May, 1931), pp. 187-202.) [551.5; 63.314.]

Some Investigations on the Sampling, Analysis, and Composition of Sugar Beet. *G. Milne, H. Trefor Jones* and *J. S. Willcox.*

(Jour. Soc. Chem. Ind. (Trans. and Comm.), 50, 18 (May 1, 1931), pp. 155T-160T.) [63.3433.]

Field Trials with "Golden Wonder" and "King Edward VII" Potatoes. *T. Whitehead.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 193-199.) [63.512-194.]

A Disease-Resisting Turnip. *W. M. Findlay.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 173-183.) [63.332.]

Grassland

Investigations into the Intensive System of Grassland Management. By the Agricultural Research Staff of Imperial Chemical Industries, Limited. II: The Mineral Content of Intensively Treated Pasture, and a Relationship between the Nitrogen and Phosphorus Contents. *A. W. Greenhill* and *H. J. Page.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 220-232.) [63.33; 63.33-16; 63.60433.]

Investigations into the Intensive System of Grassland Management. By the Agricultural Research Staff of Imperial Chemical Industries, Limited. III: The Seasonal Variation in the Mineral Content of Pasture with Particular Reference to Drought. *W. S. Ferguson.* (Jour. Agric. Sci., XXI, 2 (Apri 1931), pp. 233-240.) [63.33; 63.33-16; 63.60433.]

Nutritive Value of Pasture. VII: The Influence of the Intensity of Grazing on the Yield, Composition and Nutritive Value of Pasture Herbage (Part III.). *H. E. Woodman, D. B. Norman* and *M. H. French.* (Jour. Agric. Sci., XXI, 2 (April, 1931), pp. 267-323.) [63.33; 63.60433.]

A Preliminary Investigation into the Seasonal Variations in the Composition of Pasture under different Manurial Treatment. *A. A. Hall* and *J. Hargrave.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 50, 19 (May 8, 1931), pp. 167T-169T.) [63.33-16; 63.60433.]

The Influence of Management on the Nutritive Value of Herbage Plants. *T. W. Fagan.* (Agric. Prog., VIII (1931), pp. 65-77.) [63.33; 63.33-16; 63.60433.]

Intensive System of Grassland Management in Dairying Districts. *J. N. Whittet.* (Agric. Gaz. N.S.Wales, XLII, 4 (April 1, 1931), pp. 253-257.) [63.33; 63.33-16.]

The Importance of Strain in Grasses and Clovers. *T. E. Miln.* (Jour. Yorks. Agric. Soc., 1931, pp. 60-65.) [63.33.]

One-Year Leys Seeds Mixture Experiments. *R. G. Ferguson.* (Agric. Prog., VIII (1931), pp. 58-61.) [63.33.]

Horticulture

Market Gardening in Worcestershire. *R. C. Gaut.* (Agric. Prog., VIII (1931), pp. 44-51.) [63.5 (42).]

Course of Growth in an Apple Stock during the Maiden Year. *M. C. Vyvyan.* (East Malling Res. Station, Ann. Rep., 1930, Part II, Supplement, pp. 85-97.) [63.41.]

The Chemistry of the Rootstock-Scion Effect. I.: The Elements absorbed from the Soil. A Progress Report, *W. A. Roach.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 101-104.) [543; 63.41.]

The Chemistry of the Rootstock-Scion Effect. II: Methods for Testing the Effects of Substances in Solution on Fruit Trees. A Progress Report. *W. A. Roach.* (East Malling Research Station, Ann. Report, 1930, Part II, Supplement, pp. 105-110.) [543; 63.41.]

The Heaviest Cropping Raspberry Varieties at East Malling. *N. H. Grubb.* (East Malling Research Station, Ann. Rep., 1930, Part I, General, pp. 52-54.) [63.41.]

Three "Rogue" Varieties of Black Currants. *J. Amos.* (East Malling Research Station, Ann. Rep., 1930, Part I, General, pp. 55-60+3 pl.) [63.41.]

Strawberries at East Malling. Experiments in Strain, Time of Planting, and De-Blossoming. *W. S. Rogers.* (East Malling Research Station, Ann. Rep., 1930, Part I, General, pp. 61-67.) [63.41.]

An Experiment in Plum Thinning. *A. C. Painter.* (East Malling Research Station Ann. Rep., 1930, Part I, General, pp. 68-73.) [63.41.]

The Elimination of Sources of Error in Field Experiments. The Standardization of Fruit Tree Stocks. *R. G. Hatton.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 13-21.) [37 : 635 ; 63.41.]

Peach Stock Trials. A Progress Report. *A. W. Witt* and *R. J. Garner.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 22-31.) [63.41.]

The Cropping of Raspberry Varieties at East Malling. *N. H. Grubb.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 32-45.) [63.41.]

Recording Apparatus for Horticultural Experiments, including Automatic Counting Devices. *W. S. Rogers* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 65-73.) [37 : 635.]

Inheritance of Sex, Colour and Hairiness in the Raspberry, *Rubus idaens. M. B. Crane* and *W. J. C. Lawrence.* (Jour. Gen. 24, 2 (April, 1931), pp. 243-255, pl. VII and VIII.) [575.1 ; 63.41.]

Plant Pests and Methods of Control

The Crown-Gall Disease of Nursery Stocks. II : The Relative Susceptibility of Apple Stocks to Crown Gall. A Progress Report. *R. V. Harris.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 140-142.) [63.22.]

Some Diseases of Walnuts. *J. B. Hamond.* (East Malling Res. Station, Ann. Rep., 1930, Part II, Supplement, pp. 143-149.) [63.23 ; 63.24-41.]

Investigations on Coniothecium. A Progress Report. *M. H. Moore.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 150-156.) [63.24.]

The Causes of "Running-Out" and Non-Cropping of the Raspberry. *R. V. Harris.* (East Malling Research Station, Ann. Report, 1930, Part I, General, pp. 95-98.) [63.23 ; 63.24 ; 63.41.]

Studies in Bacteriosis. XIX : Researches on the Group of Green-fluorescent Bacteria, Part I. ; *Bacterium trifoliorum* (Jones *et al*) as the cause of a Disease of *Vicia faba. Margaret S. Lacey.* (Ann. App. Biol., XVIII, 2 (May 1931), pp. 180-186, pl. XVI.) [63.23.]

Studies on Potato Virus Diseases. IX : Some Further Experiments on the Insect Transmission of Potato Leaf Roll. *K. M. Smith.* (Ann. App. Biol., XVIII 2 (May, 1931), pp. 141-157, pl. XI.) [63.23.]

Gibberella saubinetii (Mont.) Sacc. on British Cereals. II : Physiological and Pathological Studies. *F. T. Bennett.* (Ann. App. Biol., XVIII, 2 (May, 1931), pp. 158-177, pl. XII-XIV.) [63.24.]

A New Bunt on Wheat in India. *M. Mitra.* (Ann. App. Biol., XVIII, 2 (May, 1931), pp. 178-179, pl. XV.) [63.24.]

The Effect of Meteorological Conditions on Apple Scab, with Special Reference to the Control of the Disease. *M. H. Moore.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 157-176.) [63.24 ; 551.5.]

Leaf Spot of Oats. *Dorothy M. Turner.* (Agric. Prog., VIII (1931), pp. 131-132.) [63.24.]

Studies on the Fungicidal Action of Certain Dusts and Sprays in the Control of Apple Scab. *J. M. Hamilton.* (Phytopathology, 21, 5 (May, 1931), pp. 445-523.) [63.24.]

The Resistance of Certain Apple Stocks to Attacks of the Woolly Aphis. *A. M. Massee.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 202-205.) [63.27 ; 63.41.]

The Loganberry Beetle. *W. Steer.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 210-220.) [63.27.]

Preliminary Experiments on the Physiology of the Resistance of Certain Rootstocks to Attack by Woolly Aphis. *W. A. Roach* and *A. M. Massee.* (East Malling Research Station, Ann. Rep., 1930, Part II, Supplement, pp. 111-120.) [63.27 ; 63.41.]

The Strawberry Tarsonemus. *A. M. Massee.* (East Malling Research Station, Ann. Rep., 1930, Part I, General, pp. 109-110.) [63.27.]

The Relative Value of Tar-distillate Washes, Spring Washes and Grease-banding in any Scheme of Insect Control. *A. M. Massee.* (East Malling Research Station, Ann. Rep., 1930, Part I, General, pp. 111-120.) [63.295.]

Equipment for Pest Control. *H. W. Miles.* (Agric. Prog., VIII (1931), pp. 129-131.) [63.294.]

Extracts of Pyrethrum : Permanence of Toxicity and Stability of Emulsions. *F. Tattersfield* and *R. P. Hobson.* (Ann. App. Biol., XVIII, 2 (May, 1931), pp. 203-243.) [63.29.]

Les Traitements Arsenicaux des Arbres Fruitiers et les Abeilles. *E. Giraud.* (Jour. d'Agric. Prat. 55, 18 (2 Mai, 1931), pp. 356-359 and 55, 19 (9 Mai, 1931), pp. 376-378.) [63.295 ; 63.41 ; 63.81.]

The Eradication of Prickly-Pear by Chemicals, with particular reference to Emulsions in the Systems Phenols-Gelatin-Aqueous Arsenic Acid. *R. M. Woodman* and *W. J. Wiley.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 50, 22 (May 29, 1931), pp. 183T-186T.) [63.2 ; 63.295.]

Live Stock and Feeding

Live Stock in Warwickshire. *A. Skinner.* (Jour. Roy. Agric. Soc. Eng. 91 (1930), pp. 49-58.) [63.6(42).]

Science and the Improvement of British Live Stock. *A. D. Buchanan Smith.* (Jour. Yorks. Agric. Soc., 1931, pp. 5-13.) [575.4 ; 63.60.]

Suitable Crosses for Fat Lamb Production. *R. G. White.* (Agric. Prog., VIII (1931), pp. 78-81.) [63.631.]

Economics in Pig Production. *Lord Phillimore.* (Jour. Roy. Agric. Soc. Eng. 90 (1931), pp. 58-68.) [63.64.]

The Feeding and Management of Breeding Pigs. *V. C. Fishwick.* (Agric. Prog., VIII (1931), pp. 94-98.) [63.64 : 043.]

The Occurrence of Traces of Certain Elements in Foodstuffs, and their Rôle in Animal Nutrition. *W. Godden.* (Agric. Prog., VIII (1931), pp. 81-94.) [612 : 394 ; 63.6043 ; 63.60433.]

The Calcium and Phosphorus Requirements of Farm Animals and the Effects of Deficiencies. *J. B. Orr.* (Agric. and Live Stock in India, I, 1 (Jan., 1931), pp. 80-87.) [612.394 ; 619.]

Dairying

The Problems of Dairying. *R. H. Leitch.* (Jour. Yorks. Agric Soc., 1931, pp. 31-45.) [63.711.]

Successful Milk Production. *J. Wyllie.* (Jour. Brit. Dairy Farmers' Assoc., XLIII (1931), pp. 35-41.) [63.711 ; 63.714.]

The Economics of Machine Milking. *J. Wyllie.* (Jour. Yorks. Agric. Soc., 1931, pp. 22-30.) [63.713 ; 63.714.]

Release Type Milking Machines. *W. T. Price* and *C. A. MacEachern.* (Agric. Prog., VIII (1931), pp. 111-114.) [63.713.]

Possible Influence of the Milker on the Quantity and Quality of Milk of the Individual Cow. *K. W. D. Campbell.* (Agric. Prog., VIII (1931), pp. 114-120.) [63.718 ; 63.711.]

Our Milk Supply. *R. Stenhouse Williams.* (Jour. Farmers' Club, 1931, Part 4 (May), pp. 59-80.) [614.32 ; 63.71.]

Effect of Fore-milk and of the Associated Organisms on the Character of Cheddar Cheese. *R. H. Leitch.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 204-207.) [63.73 ; 63.735.]

Calf Rearing on Milk Selling Farms. *J. Mackintosh.* (Jour. Brit. Dairy Farmers' Assoc., XLIII (1931), pp. 9-26.) [63.711 ; 63.711 : 043.]

A Pedigree Study of High Producing Ayrshires. Prize Essay. *P. T. Joyce.* (Jour. Brit. Dairy Farmers' Assoc., XLIII (1931), pp. 42-65.) [575.1 ; 63.711.]

Replenishment of Dairy Herds with Home Bred Heifers. *J. Hunter-Smith.* (Jour. Roy. Agric. Soc., Eng., 91 (1930), pp. 68-73.) [63.711.]

How to get a Tubercle-free Dairy Herd. *J. Mackintosh.* (Agric. Prog. VIII (1931), pp. 103-111.) [614.54 ; 63.711.]

Poultry and Rabbits

Recent Progress in Poultry Husbandry.

A. The Organization of Education and Research. *P. A. Francis.*

B. The Influence of Research Work on Modern Poultry Farm Practice. *R. T. Parkhurst.*

C. Physiology and Nutrition. *E. T. Halnan.*

D. The Rôle of Vitamins and Minerals. *J. H. Prentice.*

E. Diseases. *W. R. Kerr.*

F. Genetics. *M. S. Pease.*

G. Meat Production. *P. Hedworth Foulkes.*

(Agric. Prog., VIII (1931), pp. 7-33.) [37 : 6365 ; 612 : 394 ; 63.65 ; 63.651 ; 63.651 : 043.]

Chick Feeding Experiments. *H. F. Newbigin* and *R. G. Linton.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 186-192.) [63.651 : 043.]

Chicken-Rearing Experiments to Test Various Milk Products. *F. W. Rhodes.* (Jour. Roy. Agric. Soc., Eng., 91 (1930), pp. 121-128.) [612.394 ; 63.651 : 043.]

The Relationship between the First Year Egg Production and the Egg Production of Later Years. *G. O. Hall* and *D. R. Marble.* (Poultry Sci., X, 4 (May 1, 1931), pp. 194-203.) [63.651.]

An Analysis of Egg Weights. *F. J. Dudley.* (Poultry Sci., X, 4 (May 1, 1931), pp. 184-193.) [63.651 ; 63.74.]

Rabbit Culture. *J. Sherborne.* (Scottish Jour. Agric., XIV, 2 (April, 1931), pp. 183-186.) [63.69.]

Veterinary Science.

Mastitis in Cattle. *F. C. Minett.* (Jour. Brit. Dairy Farmers' Assoc., XLIII (1931), pp. 27-34.) [619.2.]

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NOTES FOR THE MONTH

Clean Milk Production and the Dairyman

WITH reference to educational work in dairying in recent years, it may be observed that the activities of Agricultural Organizers and their staffs have been concentrated mainly on clean milk production. This campaign has been carried out with considerable success, not only by means of County and Inter-County Clean Milk Competitions, milkers' competitions and demonstrations on farms and at other suitable centres, but by numerous lectures and advisory visits. These activities have spread throughout the country, with the result that the standard of milk production generally has been greatly improved.

The experience gained by those participating in this work has been that the practice of proper methods is of much more importance in clean milk production than buildings and general layout; and it is now realized that in the past too little attention has been paid to the detailed methods of production. This view has been brought in various ways to the notice of the authorities responsible for the administration of measures concerned with the public health aspect of milk production, and the Clean Milk Courses for Sanitary Inspectors have been very successful in impressing it on the men who are actually engaged in the execution of those measures.

Further, many attempts have been made throughout the country to interest the public in the movement towards a cleaner milk supply, and at the same time to emphasize the unique food value of milk.

It would seem, however, that so far little concerted effort has been made to enlist the sympathy and practical co-operation of the ordinary dairyman. It is true that a few progressive dairymen, realizing the significance of the clean milk movement, have made it their business to become actively associated with it. In the majority of the large industrial towns the dairyman is the essential link between producer and consumer,

and is usually the purchaser of the farmer's milk. Moreover, in the larger dairies, the milk is subjected to a considerable amount of handling, and, unless this is accompanied by sound hygienic methods, good work on the farm may easily be nullified before the milk reaches the consumer. The modern tendency towards larger units has led to the bulking of farm supplies, and it is realized that great discrimination is needed if the trade is to avoid contamination of high-quality milk by ensuring that it is not mixed with milk produced in a careless and unhygienic manner.

In counties where clean milk production has made considerable progress, it would probably be of mutual advantage to the educational movement, to the producers, and to the dairymen who purchase the bulk of the milk, if definite attempts were made to give the last-named an opportunity of seeing and discussing the educational work carried out by the Agricultural Organizers and their staffs. This could generally be done in the larger towns through the dairymen's local association, which would probably be willing to support the movement and to circularize local dairymen, notifying them of any conference or tours that an Organizer had been able to arrange. The Medical Officer of Health or a member of his staff would probably be willing to take part in any conference which might be arranged.

Generally, it would be advisable to arrange a series of two or three afternoon meetings on early closing days, when the dairymen would be better able to attend. The meetings might consist of (1) a clean milk demonstration at a Farm Institute, or on a typical dairy farm reasonably accessible to the dairymen; (2) visits to typical farms where clean milk production is carried out under ordinary local farm conditions; (3) addresses by the Medical Officer of Health, the Agricultural Organizer, and a local milk producer who has gained a reputation for the quality of his milk, followed in all cases by a free discussion; (4) addresses by the Agricultural Organizer, supported by the Dairy Instructor and Dairy Bacteriologist, explaining generally the educational work and facilities in the County, and also the nature of the co-operation of the provincial centre; and (5) a general discussion on the milk trade, the part played by the dairyman and methods by which he can make full use of the educational work carried out among producers.

Courses of instruction for dairymen have, from time to time, been held in various parts of the country. Perhaps

the most important of these is the annual course of lectures on the "Handling and Distribution of Milk," organized by the Chelsea Polytechnic in association with the National Institute for Research in Dairying. This course, which consists of 12 lectures spread over a period of six weeks, and is held during the early part of the year, was first started in 1926. It has proved to be so popular that, in 1931, similar courses, covering roughly the same period, were held at the Hackney Technical Institute and the North-Western Polytechnic.

In 1928, a short course of instruction, consisting of a clean milk demonstration and a conference at the Farm Institute, followed later by visits to typical farms in the county, was organized in Northamptonshire and was much appreciated by local dairymen. A course of 24 lectures, organized primarily for the benefit of the employees of the Portsea Island Mutual Co-operative Society, was given by the staff of the Hampshire Agricultural Education Committee, at the request of the Portsmouth Education Committee, during the period October, 1930–March, 1931.

Similar courses of instruction have also been held at Brighton —organized by the East Sussex Agricultural Committee in conjunction with the Health Department of the County Borough—at Bingley (Yorkshire) and at the Birmingham Central Technical College. Further courses, due to commence in the near future, have been arranged at Bristol University and the Stoke-on-Trent School of Commerce. It is understood that arrangements are being made for other courses to be held at Eastbourne, Birmingham, Dudley, Bingley and Hull, and that the matter is receiving the attention of the Agricultural Education Authorities in Essex and Leicestershire.

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Colorado Beetle Order of 1931

THE Minister announced in the House of Commons, on October 6, that, in view of the rapid spread of the Colorado Beetle in France during the past year, he found it necessary to take further steps in order to protect English potato growers against the introduction of this dangerous pest through the medium of imported produce. He had decided that the importation of potatoes from any part of France must be entirely prohibited. Nursery stock and living plants would be admitted only if they were officially certified not to have been grown within 200 kilometres of any place where the Colorado Beetle exists or has been known to exist;

between March 15 and October 14 in each year, the admission of raw vegetables, including tomatoes, onions, aubergines and salads, would be subject to the same restriction.

The Order (the Colorado Beetle Order of 1931) giving effect to the foregoing decisions has now been issued. It will not come into operation until March 15, 1932, and in the meantime the existing orders remain in force. Under these Orders, potatoes, nursery stock, etc., grown in France can be imported if they are certified not to have been grown within 75 kilometres of any place where the Colorado Beetle exists or has been known to exist.

Copies of any of these Orders may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

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Diseases of Animals Acts: Report for 1930

THE Report* on the proceedings under the Diseases of Animals Acts for the year 1930, which has just been issued, contains several new sections and describes important amendments of the existing regulations enacted in the course of the year by Orders of general application relating to foot-and-mouth disease, sheep-scab, the control of dogs, and the transit of animals by sea and in road vehicles.

The Report records the continued freedom of Great Britain from cattle-plague (*rinderpest*), pleuro-pneumonia, sheep-pox, rabies, epizootic lymphangitis (of equines), and glanders. It also describes the incidence of the six other notifiable contagious diseases of animals, viz., foot-and-mouth disease, bovine tuberculosis, swine fever, sheep-scab, anthrax, and parasitic mange of equines, and shows satisfactory reductions in the number of outbreaks in all these diseases except bovine tuberculosis.

The section dealing with foot-and-mouth disease contains a description of the serum treatment adopted by the Ministry as a concomitant of the slaughter policy and an auxiliary measure for the prevention of the spread of infection. That section also describes the types of virus that have been identified in outbreaks of foot-and-mouth disease in Great Britain during the years 1927-1930.

* *Report of Proceedings under the Diseases of Animals Acts for the year* 1930. H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 2*s.* net (post free 2*s.* 2*d.*)

The results of the administration of the Tuberculosis Order of 1925 are fully recorded, and statistics are given showing the numbers and classes of animals slaughtered as diseased, under that Order, the results of the post-mortem examinations, and the amount of compensation paid to the owners of the animals. Comparative tables showing these details for each year from 1926 to 1930 are included.

In the section dealing with swine fever is reprinted a paper that was read by Sir Ralph Jackson, M.R.C.V.S., Chief Veterinary Officer of the Ministry, at the meeting in Paris in April, 1930, of the International Office of Contagious Diseases of Animals; this paper deals with "the survival of the virus of swine fever," a subject that has an important influence on the administration of the Swine Fever Orders in this country.

Contagious Bovine Abortion is also the subject of an article that explains why this disease is not dealt with by compulsory notification and administrative action.

Part II of the Report contains a review of the administration of the measures taken to prevent the introduction and spread of contagious disease in this country, and includes particulars of the animals imported from Ireland and other countries and of the diseases found in them.

Part III describes the measures for the protection of animals and poultry from unnecessary suffering during transit by land or sea, including a brief history of the events that led up to the passage of the Animals (Sea Transport) Order of 1930, and the Transit of Animals (Amendment) Order of 1930. A statement of the casualties that have occurred during transport overseas is also given.

Part IV describes the activities of the Ministry in connexion with the certification of animals and animal products intended for export, to meet the requirements of the regulations of the importing countries, and describes the working of the London Quarantine Station for exported pedigree stock.

Part V summarizes the diagnostic work done at the Ministry's Veterinary Laboratory at Weybridge in relation to certain notifiable diseases, and records the extent of the preparation and issue of vaccine for use against contagious abortion and tuberculosis in cattle, and of the immunization of cattle against redwater (piroplasmosis) and tristeza (anaplasmosis) before export to tropical and sub-tropical countries. This section also refers to the number of agglutination tests of poultry conducted at the Laboratory, and to the large issues of fowl-pox vaccine.

Part VI contains an account of the meeting in Paris, in April, 1930, of the International Office of Contagious Diseases of Animals, and includes a brief record of the discussions on matters of major importance to Great Britain and the Empire at the eleventh International Veterinary Congress held in London in August, 1930.

Part VII is a miscellaneous section that deals with sheep-worrying and the issue of the Control of Dogs Order of 1930, and records the progress of the campaign that is being waged by the Leathersellers' Company's Committee against the warble fly pest.

The Appendices to the Report contain statistical tables of animal diseases confirmed in Great Britain during 1930, and of animals imported and exported, as well as tables showing the incidence of animal diseases in European countries during the years 1929 and 1930, and the number and breeds of stock exported with certificates issued by the Ministry during 1930.

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Wheat Meal v. Millers' Offals as a Pig Food

THE following note has been communicated by Mr. V. C. Fishwick, of the South-Eastern Agricultural College, Wye, Kent:—When wheat is cheap, the question is constantly raised whether wheat meal can be substituted for wheat offals in pig rations. A trial, carried out at the South-Eastern Agricultural College during the winter of 1930-31, indicates that the substitution can be made providing the ration is properly balanced.

The meal used in this trial was ground upon the farm. Wheat can be ground with an ordinary farm grinding-mill fitted with chilled-steel plates, but the meal is not very finely ground. A more finely-ground sample can be obtained by the use of emery-grit plates; these can be fitted to many farm grinding-mills. Emery plates require dressing periodically; if a mill is in regular use, they should be dressed once a month. The hammer-mill will give even finer grinding than the emery-grit plates. The writer, however, prefers that wheat meal, to be used for pig food, should be comparatively coarsely-ground, because the finely-ground meal makes a sticky paste when mixed with water. The cost of grinding on the College farms works out at 10*s.* per ton.

There is a certain amount of confusion regarding wheat offals. This is due partly to the fact that different names are used in various districts for materials that are similar in

type, and partly to the lack of uniformity in the products turned out by different mills. An effort is being made to standardize the wheat offals produced by British mills, and it is hoped that this very desirable reform will be effected in the near future. For practical purposes, the wheat offals that are on the market to-day may be divided into two groups: (1) the coarser products that are universally known as brans, and (2) the finer products that are known by a variety of names, such as middlings, sharps, thirds, parings, boxings, toppings, wheat-feed. In this note, the latter group will be subsequently referred to as middlings.

There is on the market a comparatively small amount of fine middlings that have a fibre content of less than 3 per cent. The greater part of the output of middlings consists of coarse middlings, that is to say, materials with a fibre content of between 4 and 6½ per cent. They contain 14 to 18 per cent. of protein and have a starch equivalent of between 60 and 70. It is products of the latter type that are chiefly used in pig-feeding. An average sample of wheat meal will contain 1·9 per cent. of fibre and 12 per cent. of protein, and have a starch equivalent of 72.

It will be seen that there is not a very great difference between the analysis of a good sample of coarse middlings and that of wheat meal. Viewed as pig foods, the greatest discrepancy lies in the fibre content. If wheat meal is substituted for coarse middlings in a pig ration, it is possible that digestive disturbances may be occasioned unless an adjustment is made in the fibre-content of the mixture. For comparative purposes, in the experiment under discussion, a good sample of coarse middlings containing 5.4 per cent. of fibre and 17 per cent. of protein was used. The fibre content of the wheat meal ration was adjusted by the addition of a small quantity of broad bran. The rations used are given in Table I.

TABLE I.—RATIONS

	A		B	
	45 to 90 lb. live weight		Over 90 lb. live weight	
	Lot 1 (Control)	Lot 2	Lot 1 (Control)	Lot 2
	Per cent.	Per cent.	Per cent.	Per cent.
Soya bean meal ..	10	10	7½	7½
Barley meal ..	50	50	62½	62½
Coarse middlings ..	40	—	25	—
Bran	—	10	5	10
Wheatmeal ..	—	30	—	20

1½ lb. chalk and ¼ lb. salt were added to each 100 lb. of mixed meal.

Six litters of strong weaners were available for this trial; the best and worst pigs were removed from each litter and the remainder were divided into two groups, so that both groups

contained the same number of pigs from each litter. There were sixteen pigs in each group. The trial was started when the pigs were of average live weight of 45 lb., and was continued until the pigs were sent to the butcher. Rations A were used until the pigs averaged 90 lb. live weight and Rations B from that time until the pigs were sent to market. The pigs received as much food as they would clear up readily throughout the trial. Table II gives a summary of the results obtained.

TABLE II

	Lot 1 (Control)		Lot 2	
	Total	Average	Total	Average
	lb.	lb.	lb.	lb.
Starting weight ..	720	45	725	45.3
Finishing weight ..	2,076	129.7	2,093	130.8
Increase	1,356	84.7	1,368	85.5
Carcass weight ..	1,463	91	1,482	92.0
Loss on slaughter ..	—	30%	—	30%
Meal consumed (total)	5,120	—	5,161	—
Meal consumed for each 1 lb. live weight increase ..	—	3.78	—	3.77

In considering the results obtained it must be remembered that high-grade, coarse middlings with a fibre content of 5.4 per cent. were used. A less favourable result might be expected from the control ration if an inferior grade of middlings were used.

Differences such as those obtained in this trial have no practical significance. The results indicate that there was no material difference in the feeding value of the two sets of rations, and that a mixture of wheat meal and broad bran makes a satisfactory substitute for high-grade, coarse middlings.

As regards the comparative economy of the two foods, the cost of carting wheat to the mill or rail and the middlings from the mill or rail to the farm must be considered. This is an item that varies with the situation of the farm and that only comes to an appreciable amount on outlying farms. Taking into consideration the cost of grinding, it is apparent from the figures given above that it is economical to grind home-grown wheat for pigs, instead of purchasing middlings, if the price of wheat is 10*s.* or more per ton lower than that of good-quality, coarse middlings.

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Redemption of Tithe Rentcharge

THE Minister announces that, for the purpose of the redemption of tithe rentcharge, for which application is made after September 30, 1931, until further notice, the compensation for redemption will be twenty-one times the net amount of the tithe rentcharge, after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

THE SOLUTION OF A BREEDING PROBLEM

THOMAS SCOTT.

THE registration of pure-bred cattle in the herd books of the various breed societies has been of inestimable value in the improvement of live stock in this country, but it is common knowledge that a pedigree in the herd book offers no guarantee that a cow is capable of paying her way commercially, or that a bull inherits, or is likely to transmit to his daughters, a high propensity for milk-production. Now that official milk-recording has come into general practice, it is possible to combine the two functions of pedigree and performance and, eventually, to approach more closely to the ideal.

A milk-survey of the South Devon breed of dual-purpose cattle has been undertaken with the object of discovering its strong and weak points. A breed that can produce *Milkmaid XIV* stimulates the desire to investigate problems relating to the inheritance of milking-capacity, and to devise some practical method whereby breeders can improve the standard of their herds.

The survey is based upon the past and present milk records of 55 pedigree herds, comprising some 4,000 cows and 300 bulls, and it is hoped that the results obtained may be of some assistance to owners of other breeds. A variety of factors, such as environment, management, the age at first calving, disease, etc., prove to have a definite influence on the ultimate milk-yield, but by far the most important factor of all is the employment of a suitable sire.

The chief object of the survey has been that of following up the records of the bulls and of gauging their influence on milk-production. There stand revealed many tragedies that need never have occurred if reasonable precautions had been taken. Worthless bulls have been used in good herds when evidence of their unsuitability could have been obtained by referring to the milk-records of their ancestors. Valuable bulls have been slaughtered before their good work has been discovered, and yearling bulls from the best stock have been allowed to go to non-pedigree herds or even to other breeds.

Scientific investigation warrants the assumption that a sire and a dam each contribute one-half of their respective milk-properties to their offspring. Thus, it can be said that a 1,000-gallon bull mated to an 800-gallon cow will probably produce a 900-gallon son or daughter. Conversely,

it may be argued that daughters that average 900 gallons and are from dams that averaged 800 gallons, were sired by bulls whose "index" was 1,000 gallons. This method of determining the milk-transmitting power is found to be quite satisfactory, provided that the calculations are based upon a sufficient number of dam-daughter pairs and not on the records of a few selected individuals.

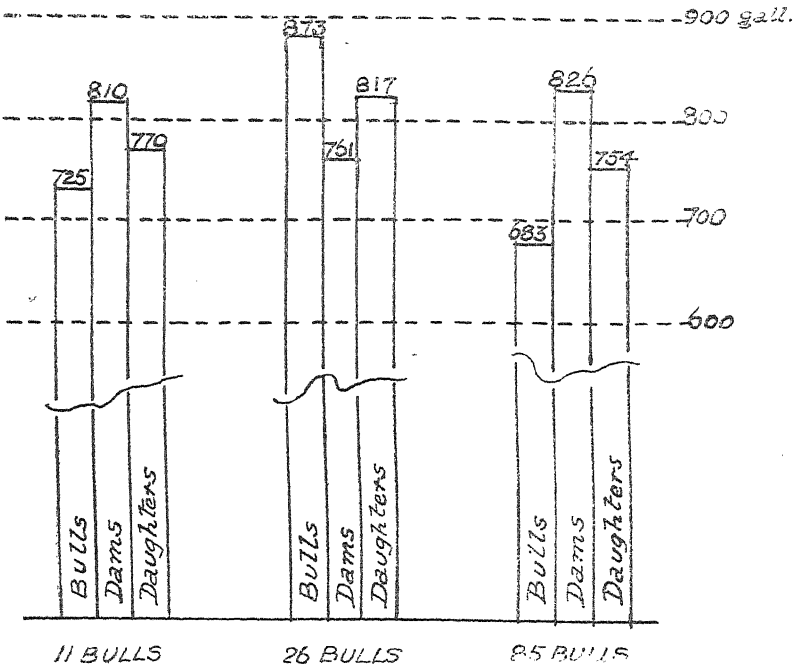


FIG. 1.—Diagram illustrating the performances of 111 bulls.

The milk registers that have been studied in this survey afford reliable details of 111 bulls with an average index of 725 gallons. They were mated to 903 cows, averaging 810 gallons, and produced daughters that averaged 770 gallons. These milk-yields are what the cows actually gave, or might reasonably be expected to give on reaching maturity. It is, therefore, obvious that the general quality of the bulls is not up to the standard of the breeding cows, and that the general level of milk-yield is maintained by careful selection of the dams and by a limited number of superior bulls.

Only 26 of these bulls improved the milk-yield; the other 85 either just maintained it, or actually lowered it. These 26 bulls, with an average index of 873 gallons (about 150 gallons above the common average) although mated to cows

(761 gallons) that were slightly below the average, produced daughters that were 50 gallons better than their dams. This shows clearly how selected bulls can improve the milk-production of the herd.

The remaining 85 bulls were of very little credit to the breed as far as milk-production was concerned. Their average index was only 683 gallons, and though they were mated to the highest-grade cows giving 826 gallons, the daughters were the poorest of all.

The only sure and certain way of finding a successful bull is to acquire one whose daughters have already proved to be good milkers, but by that time he may be some six years old, if he has not long since been sent to the butcher. Authorities are agreed that the milk-transmitting power of a bull cannot be judged by inspection, but only by the actual performance of his daughters as compared with that of their respective dams.

In the case of a young bull, all that can be done is to study the milk-records of his ancestors. Up to the present time, breeders have had to rely upon the performance of the dam and dam's dam and possibly, also, that of the sire's dam, but it now becomes practicable to include the record of the sire as well, and thus to more than double the chance of "spotting a winner."

Instances of actual milk pedigrees will help to explain the system.

G. Sire 440 } Sire 524 }
G Dam 650 } } Yearling Bull
G. Sire 580 } Dam 570 }
G. Dam 533 }

The above is the milk pedigree of a beautiful young bull bred by a farmer who pays more attention to beef than to milk. The record shows that neither its sire nor dam were up to the standard of dual-purpose animals and that the bull is not suitable for a dairy herd. Yet it was purchased by a man whose herd averages over 800 gallons, and it will be some four years before the owner realizes that his herd has been half-ruined.

Here is the milk pedigree of a yearling bull showing a definite effort to breed for milk.

G. Sire 810 } Sire 900 }
G. Dam 995 } } Yearling Bull
G. Sire 728 } Dam 955 }
G. Dam 1,350 }

The record of the dam, dam's dam and sire's dam are all excellent, but the most convincing feature is that the sire has already proved himself to be the getter of high-yielding heifers. This young bull may reasonably be expected to earn an index of 900 gallons, but unfortunately he has gone to an unrecorded herd and it is probable that his index will never be obtainable.

The indiscriminate breeding of bulls from unrecorded stock, and even sometimes from known failures, suggests that better organization and more enlightenment are needed if any material progress is to be made, but this improvement can only take place through the intelligent study of pooled milk-records.

Objection may be raised that very little reliance can be placed on figures when breeding problems are under consideration, and that it is impossible to foretell from the records of his sire and dam what a young bull will be likely to do in actual practice. It must be admitted that such estimates cannot be relied upon with certainty, but the probability of their proving correct is very definite.

The following diagram represents the actual performance of 25 bulls, each of which had a proved sire and a recorded dam. No selection has been made, the list including every instance covered by the three complete records.

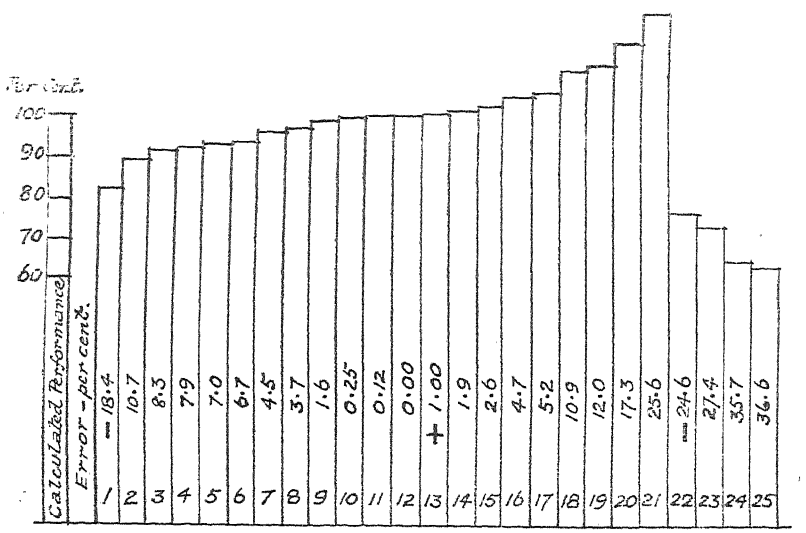


FIG. 2.—Record of 25 bulls, showing the error between "calculated" and "actual" performance.

The first column indicates what the bulls were calculated to do, whilst the other columns show what each of the 25 actually did.

Bull No. 1 earned an index that was some 18 per cent. below the figure calculated, whereas bull No. 20 was 17 per cent. above the estimate. The average error on the first 20 works out at 6·24 per cent., six of them being within 2 per cent. Finally, there come five " exceptions that prove the rule " ; the system does not claim to be infallible. One of these five is exceptionally high and the other four are abnormally low. Irregularities such as these can never be eliminated altogether, particularly in a dual-purpose breed and in a district where it is the general custom to select a dairy bull on its beef points ! It is probable that, in a true dairy breed, the fluctuations would be far less noticeable.

The result may be summarized thus : in 8 cases out of 10 the calculations can be relied upon as giving a definite and trustworthy indication of the probable performance of an unproved bull. The ninth case will be somewhat wide of the mark and the tenth case wholly unreliable.

It may, therefore, be claimed that a detailed analysis of the milk records of a breed, together with figures and calculations intelligently applied, can be of very real assistance in solving one of the greatest problems that confront the breeder. The system is, of course, not perfect ; indeed, it is hopeless to expect perfection in the solution of problems of this nature. There are many difficulties to be overcome in practice, but they are worth overcoming in view of the promising issues involved.

It cannot be too strongly urged that neither registration in the annals of the Herd Book Societies nor records in the official Milk Registers are sufficient in themselves to satisfy modern requirements. It is essential that the two should be co-ordinated in order that each may exert its fullest influence.

It would be of untold benefit to breeders, and to the breed in general, if all pedigree herds producing milk were recorded, and the records submitted to some central authority such as the Herd Book Society or an Association of milk-recorders. Such an organization would register the performance of all bulls used in recorded herds and would search out young bulls with promising milk pedigrees, arranging for their preservation until their daughters had come into milk ; then would be the time to decide whether they should be slaughtered or not. Records would be kept of the most prepotent cows

and attempts made to breed successful bulls from them by mating them to the highest-grade bulls to be found in the breed, thus ensuring the continuity of the most desirable strains. Foreign buyers would be able to get information that is not yet available and home breeders would be assisted in finding bulls suited to their special needs. The advice of experts in genetics might be obtained on problems relating to breeding and valuable research work carried out under their guidance.

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FURTHER NOTES ON THE ECONOMIC POSSIBILITIES OF RICE GRASS

[*Note.—In the issues of this* JOURNAL *for November and December*, 1928, *and January*, 1929, *articles* were published on the economic possibilities of Rice Grass* (Spartina Townsendii) *as an efficient reclaimer of tidal muds. The following articles give particulars of the further progress made in the experiments in Holland and Essex then described.*]

I.—PLANTINGS IN HOLLAND

F. W. OLIVER, F.R.S.,

Professor of Botany in the Egyptian University, Cairo.

IN the writer's previous communication on this subject, some account was given of the bold and large-scale experiments, particularly those in Zeeland and in the estuary of the Scheldt, which, as seen in September, 1928, had then been in operation for three or four years under the supervision of the Dutch reclamation officers.

Following the International Congress of Botanists at Cambridge last year (August, 1930), a further inspection of the Scheldt plantations was made possible through the courtesy of the Dutch authorities and, particularly, of the moving spirit, Mr. A. G. Verhoeven, the officer for reclamations in Zeeland. On this occasion, ten members of the Congress, all familiar with Spartina practice, crossed over to Middleburg in response to the Dutch invitation. The following note is a brief report on the progress of the plantations during the period 1928-30.

Taking first the Sloedam plantation (the most extensive one), all the original (1924-25) plants had continued their

**The Economic Possibilities of Rice Grass* (Spartina Townsendii). I. Professor F. W. Oliver, November, 1928, page 709 ; II. Experiments in Essex, James Bryce, December, 1928, page 817 ; III. Composition and Nutritive Value, Frank Knowles, January, 1929, page 934.

vegetative spread so that the Spartina field had completely meadowed, with obliteration of the intervening strips of bare mud. The plantation was also largely extending in a southerly direction, partly by further planting, but more especially by the natural spread through seeding. In those places where vegetative expansion of the original tufts had not led to contact, the interstices had become filled with self-sown seedling plants, so that the meadowing was complete. This is shown in Figs. 1, 2 and 3, which may be compared with the condition in September, 1928, shown in Figs. 1A, 2A and 3A, respectively, which have been reproduced from the previous article (November, 1928). The general level of the land had also been raised markedly by silting.

Turning now to the first line of Spartinas, described in the previous article (page 720 and Fig. 6 of the article of November, 1928), these occur on an island that is being incorporated in the general Sloedam plantation. When revisited, two features were outstanding. Whilst, in 1928, all the ground about the tufts was relatively bare, it was now found to be covered everywhere at maximum density with self-sown seedlings of Spartina, together with dense and luxuriant growths of various halophytes, among which *Salicornia annua* was conspicuous. Spartina has an almost magical touch in stabilizing soft muds, and where it has entered other plants can follow. But even more striking was the curious impression that the original plants had sunk into the mud. The impression was illusory, since actually it was due to the fact that the soil had everywhere risen under the joint silting of the different plants concerned—risen so fast, indeed, that the Spartinas appeared to have lagged behind.

In certain regions in the Sloe, there is excessive scour at particular stages of the tide, and there was general admiration for the tactics employed by Mr. Verhoeven in coping with such emergencies by additional, *ad hoc* plantings of Spartina, and for the versatility shown in devising minor expedients for meeting various contingencies.

Those in charge of the plantations expressed a conviction that the extensive Sloedam area would be ready within the next three or four years for polderizing (*i.e.*, banking in) and handing over to the farmer for cultivation. As the next International Congress of Botanists is to be held in Holland in 1935, the completion of the first Spartina polder by that date would be singularly appropriate.

As this particular area is generally accessible from Middleburg, those interested in reclamation problems should take an early opportunity of visiting the work and studying the methods employed. The Sloedam area may rightly be called "classic," as it is the pioneer effort in an entirely new technique for reclamation. In a few years, Spartina, having fulfilled its function, will have ceased to exist. Apart from the relative fertility of Spartina ground, as compared with other poldered areas, the ground will have little interest except to farmers and the taxing authorities.

Of the other areas under treatment, reference may be made to the Verdronken land much higher up the Scheldt at Saeftinge. This is representative of much ground that was lost centuries ago by inroads of the sea and has never reclaimed itself. Here the plantations are extraordinarily luxuriant, and the spread by self-sown seedlings conspicuous. It is evident that, under Spartina, the recovery of such land is shaping well.

These two examples from Zeeland may be regarded as characteristic of what is being done in the waterways in this part of Holland.

The younger plantations in the north were not visited, although favourable reports were given about them. On account of the colder climate, progress is less rapid, and this appears to apply also to some still more recent plantings on the German side of the frontier (Juist).

In conclusion, it may be remarked that the employment of the Spartina method of reclamation is much accelerated where climatic conditions favour a good output of seed three years out of five, as, by self-sowing, nature rapidly continues and extends the work started by man. From the climatic point of view, Zeeland appears to be ideal, and the same may be said of the north coast of France and, in slightly lesser degree, of southern England.

Reference has been made above to tactics in planting and, from the practical point of view, they are of immense significance. On any area selected for Spartina treatment, there is an ideal method of procedure whereby the minimum effort only need be employed. With experiment and insight, it becomes possible, after a minimum of planting, to depend upon nature to complete the scheme. Only those who have made large-scale experiments are in a position to describe the actual processes employed—such as the matter of spacing, the leaving of areas vacant to be filled by natural spread or by

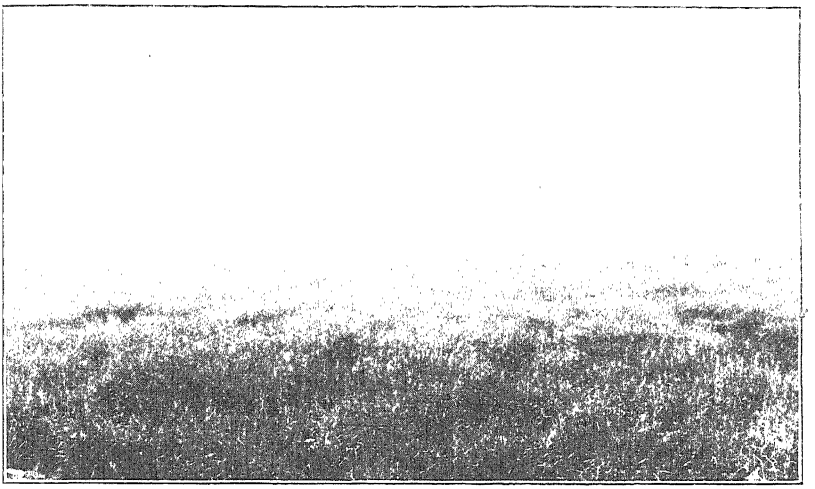


FIG. 1.—The Sloedam, Zeeland (Holland), Spartina plantation, looking south. View taken September, 1930. Compare with Fig. 1A.

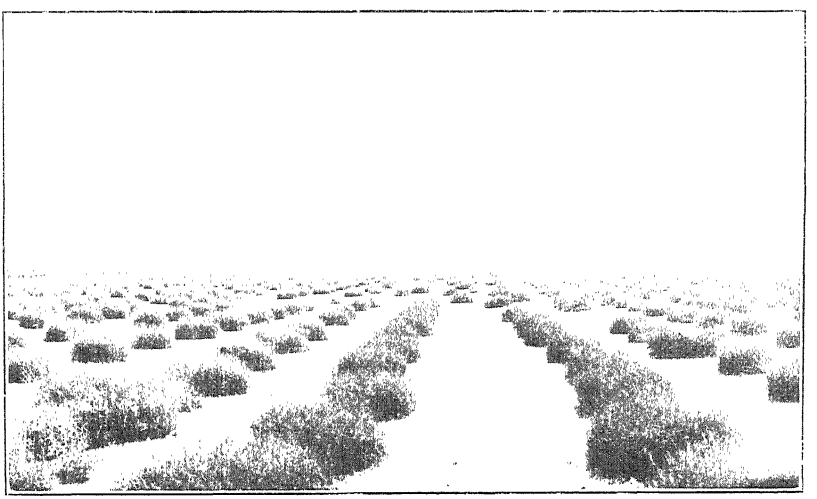


FIG. 1A.—The Sloedam, Zeeland (Holland), Spartina plantation. The same view as Fig. 1 above, but taken in September, 1928.

FURTHER NOTES ON THE ECONOMIC POSSIBILITIES OF RICE GRASS.



Fig. 2.—The Sloedam, Zeeland (Holland), Spartina plantation, from east end of embankment. View taken September, 1930. Compare with Fig. 2A below.

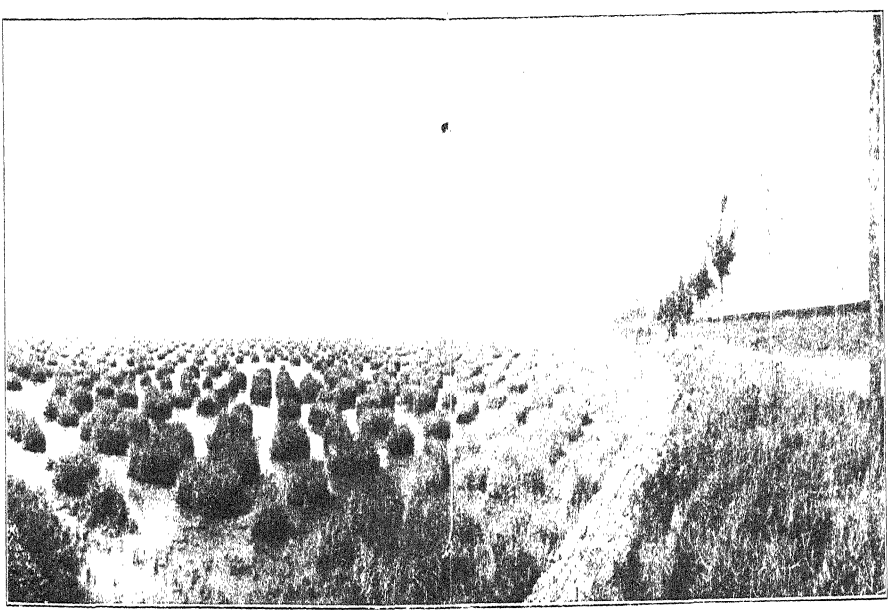


Fig. 2A.—The Sloedam, Zeeland (Holland), Spartina plantation. Same view as Fig. 2 above, but taken in September, 1928.



FIG. 3.—The younger portion of the Sloedam, Zeeland (Holland), Spartina plantation. View taken in September, 1930.

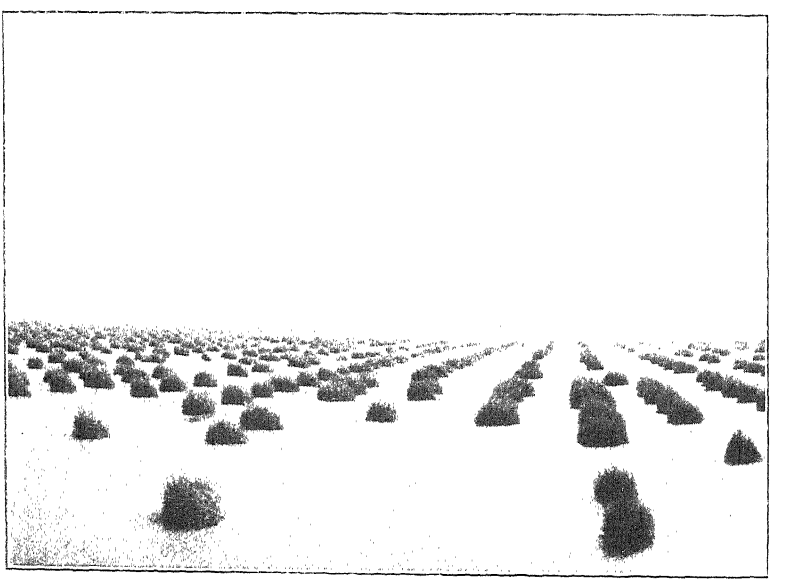


FIG. 3A.—The younger portion of the Sloedam, Zeeland (Holland), Spartina plantation. The same view as Fig. 3, but taken in September, 1928.

seeding, the treatment of creeks, and so forth. Consequently, in the general interest, it is much to be hoped that Mr. A. G. Verhoeven, who has directed the pioneer Dutch experiments, may find an opportunity of recording his successful technique, with illustrative examples. For Spartina reclamation is a world-method in its infancy and is destined, provided population and agriculture continue to expand, to add hundreds of thousands of square miles to the cultivable area of land.

II.—PLANTINGS IN ESSEX

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In the writer's previous communication, an account was given of experiments with Rice Grass carried out, between 1925 and 1928, at various centres in Essex. In the present note, the progress at these centres, up to the end of 1930, is described first, and is followed by an outline of larger-scale operations begun in 1929-30.

Plantations made before 1929: (*a*) *Northey Island.*—By 1928—that is, after three years, the planting distance being 1 yd. each way—the plants in the two successful plots were in contact, and it is now impossible to distinguish them individually. Meadowing, by November, 1930, was complete, as shown in Figs. 4 and 5. Figs. 4 and 5 should be compared with Figs. 4A and 5A (reproduced from the previous article, December, 1928). Figs. 5 and 5A show practically the same view with an interval of 3½ years. There is a similar interval of time between Figs. 4 and 4A, but the former shows the centre of the plot, whereas the latter gives a side view. The broad-leaved Aster of Fig. 4A, which was the principal occupant of the site before the coming of Rice Grass, has been almost eliminated.

While Figs. 4 and 5 illustrate the conquest of Aster, they also show, on the right of the views, that Rice Grass has now made contact with a new and more formidable competitor in the form of the saltings grass, *Glyceria maritima.* Glyceria prefers a slightly higher level than Aster. Observations in France at the mouth of the Seine show that, where Glyceria has followed Rice Grass, the latter has, in some degree, been suppressed,* but at Bradwell, in Essex, where Rice Grass has been planted amongst Glyceria, we find that,

* F. W. Oliver, "Spartina in France," *Gardeners' Chron.*, March 26, 1926, p. 212.

on the whole, Glyceria is tending to give way to the newcomer.

The nature of the contest between these two grasses is interesting. Whereas Rice Grass is equipped with deep roots, strong rhizomes and stiff, erect, aerial stems and broad leaves, Glyceria has shallow roots and weak straggling stems with narrow leaves. Ungrazed Glyceria forms a dense surface mat. When growing together, the thin, flexuous shoots of Glyceria spread over and are lifted up by the stiff leaves of Rice Grass and so have a smothering effect. Probably the main determining factors in the conflict are climate and the physical nature of the mud. As regards climate, Glyceria certainly grows better and stronger in the Seine estuary than in Essex, while no appreciable difference could be noticed in Rice Grass occupying comparable situations in these districts. The firmer and stiffer the mud, the slower and more difficult is the task of Rice Grass when pushing out its rhizomes and the more Glyceria is favoured in competition. As far as Essex is concerned, the indications are that, on the balance, conditions favour Rice Grass. See Figs. 6A (from the previous article) and 6. Numerous self-sown seedlings and young plants are now to be found scattered over the island.

(*b*) *Bradwell.*—As indicated, the position here is resolving itself into a contest between Rice Grass and Glyceria. After four years' growth, the average area covered by each plant is about 30 square feet. The best occupies 56 sq. ft. of surface and the most backward 1 sq. ft. These two plants were originally set in almost identical situations—at the head of a small pan of bare mud bordered by Glyceria (Fig. 6A). As Rice Grass extended, Glyceria closed in, until the pan became covered with vegetation. But whereas the best of the plants now overtops and is advancing into Glyceria (Fig. 6), the poorest is almost smothered and is having a hard struggle to maintain its position. As at Northey, self-sown seedlings are plentiful.

In front of the sea-wall, from Bradwell southwards to the Crouch estuary, lies an area of very extensive mud-flats, much of it on a high level. At low water, it is possible, in places, to walk outwards from the sea-wall for about two miles. In the event of economic conditions in Britain becoming such as to encourage further reclamations of land from the sea, this part of the coastline offers a very favourable area for treatment. In the meantime, the methodical introduction, somewhat on the lines followed by the Dutch, of Rice Grass

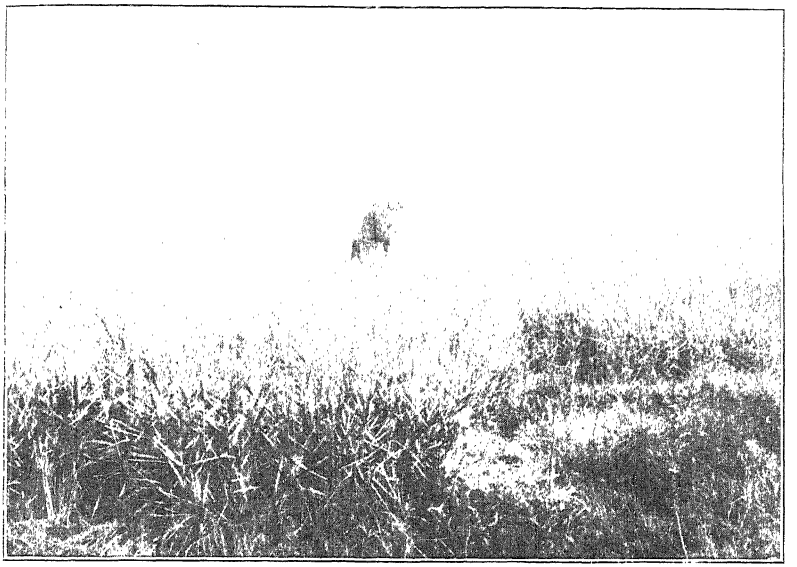


FIG. 4.—Spartina plantation at Northey Island, Essex. View inside the walls, taken November, 1930. Compare with Fig. 4A.

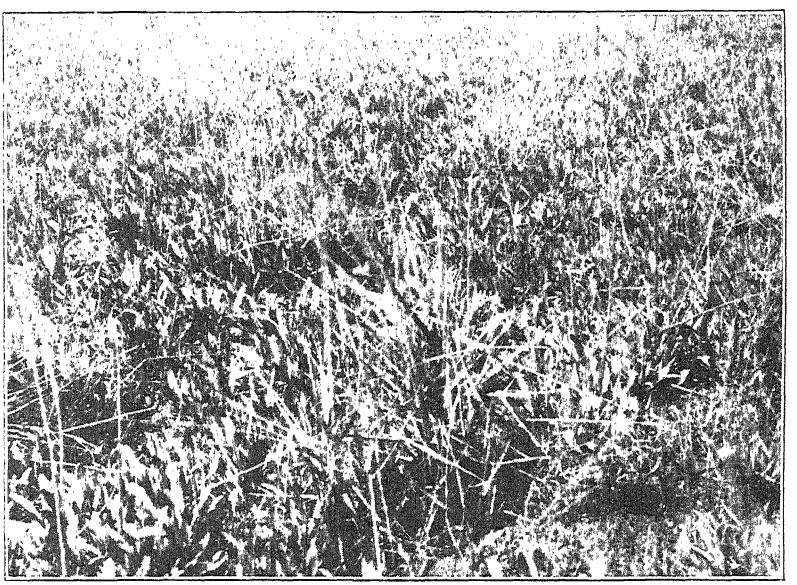


FIG. 4A.—Spartina plantation at Northey Island, Essex. View inside the walls, taken May, 1927. This view shows the centre of the plantation, of which a side view is given above. The extent to which Sea Aster (the main vegetation seen in this view) has been replaced by Spartina may be gauged by comparison with Fig. 4.

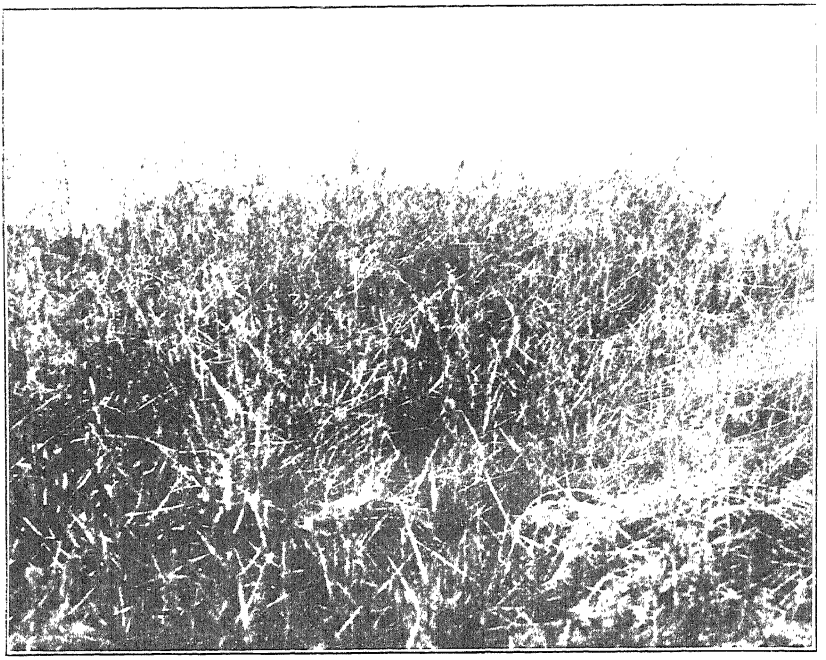


FIG. 5.—Spartina plantation, Northey Island, Essex. View outside the walls, taken November, 1930. Compare with Fig. 5A.

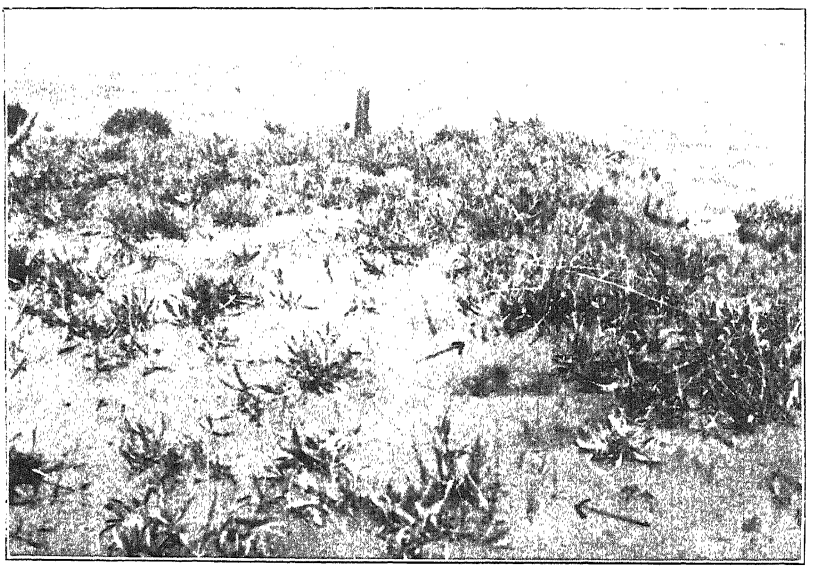


FIG. 5A.—Spartina plantation, Northey Island, Essex. View outside the walls. Same view as Fig 5 above, but taken May, 1927.

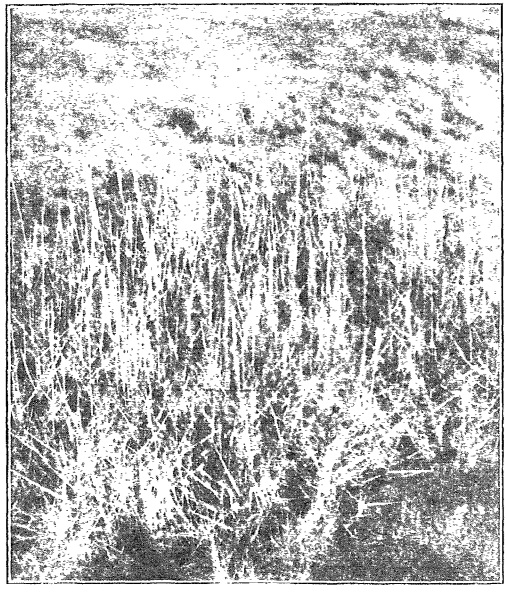


FIG. 6.—Saltings at Bradwell, Essex.



FIG. 6A.—Saltings at Bradwell, Essex.

The spread of a plant of Spartina, growing in a shallow pan, bordered by the grass, *Glyceria maritima*, can be gauged by comparing Fig. 6 (taken November, 1930) with the view of the same spot shown in Fig. 6A (taken June, 1927).

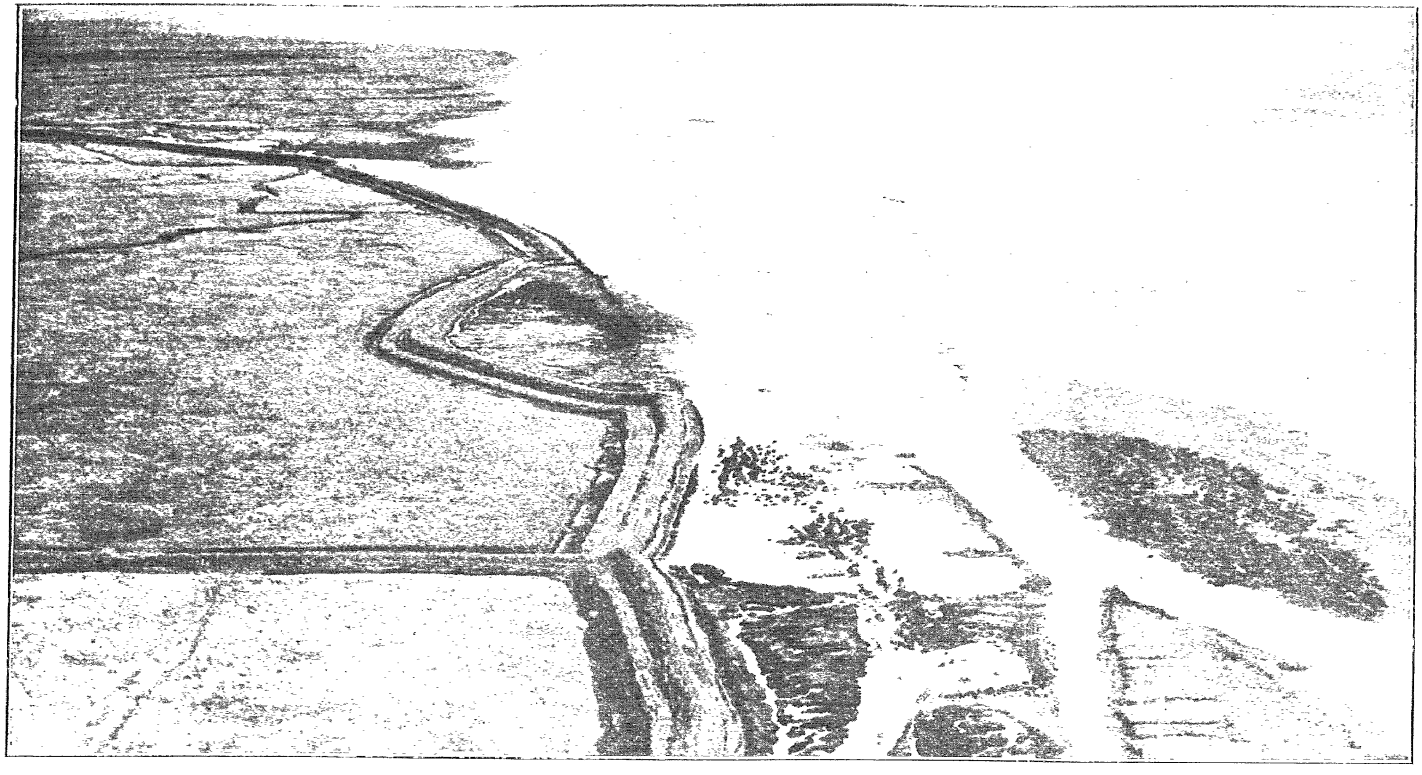


FIG. 7.—Aerial view of the Spartina plantations outside the wall at Hadleigh, Essex. Planted, 1929. See page 803.

to these mud flats might act as an inexpensive yet valuable preparer of the ground, and seems to be a matter well worth consideration.

(*c*) *Goldhanger.*—Here, the main interest centres round the three plants set, during 1926, amongst Zostera at the low level of 8 ft. below spring tide high-water mark. Until 1928, there were no signs of inflorescences or of lateral growth by rhizomes. In 1930, they consisted of clumps 4 ft. × 4 ft., 3 ft. 4 in. × 2 ft. 3 in., and 4 ft. × 3 ft., with 400, 130 and 205 shoots respectively, and they have flowered freely, producing viable seed. This rate of growth for Rice Grass must be regarded as slow, as, under optimum conditions, plants of 3 ft. diameter can be obtained in one year. It suggests that the conditions of the situation approach the limit which Rice Grass can stand. Further plantings at Goldhanger, even to a level lower than the above, have been based largely on the behaviour of these three plants.

(*d*) *Mersea.*—The surviving eight plants here, mentioned in the previous article (p. 820, December, 1928), had disappeared by June 28, 1928. Fast currents and occasional heavy seas are believed to be the causes of this failure. It is expected that Mersea will be included in the investigations on the effects of tidal currents, since one plant, set on July 28, 1927, on the same mud flat as the above, but about a mile to the east, where conditions seems to be slightly quieter, has grown satisfactorily.

Operations begun in 1929 and 1930.—Before 1929, the experiments consisted of testing a comparatively small number of plants in a variety of situations. With the knowledge gained from this work, larger-scale experiments, involving thousands of plants, were planned and started in 1929 and 1930. Two centres were chosen, offering conditions that appeared to be within the scope of Rice Grass. These were at Hadleigh in the Thames estuary, begun in 1929, and at Goldhanger on the Blackwater, begun in 1930. At each, the immediate object in view was the prevention of erosion along a given length of coast line.

(*a*) *Hadleigh.*—This site is well illustrated in Fig. 7. The area planted extends for about half a mile from the saltings in the background to a point in the foreground in line with the wall crossing the pasture on the left. That erosion is severe along this front is shown by the fact that the original sea-wall has been broken down, the gap being filled by building

a " horse-shoe " bend round it. 7,000 cuttings in rows, 5 yards apart and parallel to the wall, were planted, thus connecting the vegetation at both ends of the stretch of bare mud. With the exception of the arc from the far horn of the horseshoe to the saltings in the background, growth has been satisfactory. Investigations into the causes of the failure of a part of the plantation are proceeding, and there are indications that the speed of the tidal current is the important, if not the only, factor responsible.

(*b*) *Goldhanger.*—At this centre, the front planted extends for about a mile, and includes almost every variety of condition as far as depth below high-water mark, nature of the mud, and presence or absence of natural vegetation are concerned.

As the winter, 1929-30, was very favourable for seed-production and the growth of seedlings, large numbers of the latter were obtainable and they were planted in alternate rows with mature cuttings. It will thus be possible to make a comparison between seedlings and cuttings for the purpose of propagation. This matter is of some importance, as seedlings or yearling plants are damaged less in lifting, involve less labour and time, and, according to Dutch opinion, are better able than cuttings to withstand extreme conditions.

During July and August, 1930, approximately 20,000 cuttings and seedlings were planted, a large proportion of which appeared, by November of that year, to have become established.

(*c*) *Other Plantings.*—In addition to the plantations at Hadleigh and Goldhanger, other smaller plantations were made, in 1930, at Northey, Mundon and Wakering, where the erosion problems differ in some respects from those at Hadleigh and Goldhanger. For example, at Northey, a roadway leading to the island is being undercut; while, at Mundon, new sections of wall have recently been built, the clay of which, as yet carrying no perennial kind of vegetation, stands exposed to the action of sea and weather. In both cases, Rice Grass has been planted on and in front of the surfaces subject to erosion.

Summary.—The experiments were started in 1925 and have continued until 1930. They show that, in Essex, Rice Grass can be successfully grown under the following conditions :—

(*a*) from high-water mark of spring tides down to 8 ft. below that level, involving periods of immersion from a few minutes on the highest levels to four hours on the lowest, with a corresponding variation in water pressure.

(*b*) on mud of varying consistency, from the firmest on which the foot hardly leaves an imprint to the softest where one sinks to the knees or further.

(*c*) on mud containing varying proportions of sand, gravel and organic matter, the latter in different stages of decomposition. Hydrogen sulphide, very evident in some muds, does not appear to be toxic to the plants.

(*d*) on mud that is quite bare, and amongst the natural vegetation of both high and low saltings where the Rice Grass may quickly become dominant. Its most serious opponent appears to be the perennial grass *Glyceria maritima* of the high saltings. *Aster Tripolium*, *Zostera*, the annuals *Suaeda* and *Salicornia*, and *Fucus limicola*, sooner or later give way to it.

The experiments show that in certain places where, in accordance with the foregoing, one would expect successful growth, Rice Grass is, in fact, unable to establish itself. Observations at such places give the impression that the speed of the ebb tide is higher than at other points. Experiments are being designed to discover whether or not a correlation exists between the speed of tidal currents and the growth of Rice Grass.

In the event of these experiments yielding positive results, it should then be possible to state the chief requirements for the successful growth of Rice Grass and also to make recommendations on the suitability of any given situation and on the best disposition of the plants to compete with excessive scour.

That other factors, probably of minor importance, such as salinity of the sea and mud, toxic substances in mud, oil discharged by shipping, damage by birds or sea animals, may also play a part in the local limitation of Rice Grass remains a possibility.

* * * * * *

THE STORAGE OF SUGAR-BEET ON THE FARM

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Introduction.—At the commencement of the autumn of 1928, the writers were approached by the Shropshire Beet Sugar Company with the object of obtaining data on the subject of the changes that take place in the composition of sugar-beet when clamped on the farm. The need for this information arose from the fact that every agreement between the above-named factory and a grower stipulated that, in case of necessity, the latter must be prepared to clamp his beet until required. The work was commenced on October 30, 1928, when an experimental clamp was built in a field adjoining the factory, the sugar-beet being provided by the company. The technical work was carried out in the College Laboratory; the factory provided the labour for building the clamp.

Experiment of 1928–29.—The clamp constructed is illustrated in Fig. 1; it was of dimensions similar to that used by Ling, Newman and Clarke* in their work.

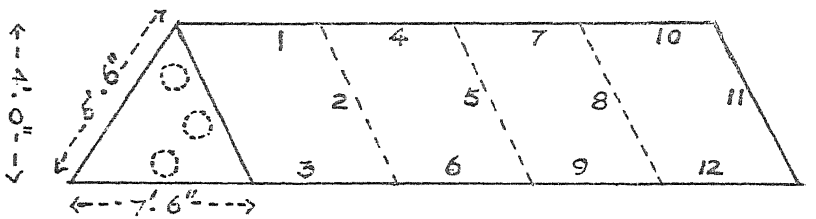


FIG. 1.

A large number of sugar-beets, drawn from one consignment, was washed, retopped and thoroughly mixed. From these were drawn, for analysis, three samples, each containing fifty roots, in order that the initial content of sugar, dry matter, etc., could be obtained. They served as a standard with which to make, from time to time, comparisons of any changes that might occur in other similar lots enclosed in the clamp.

* "Some Recent Investigations into Sugar Beet Problems." By G. R. Clarke, L. F. Newman, and A. W. Ling. This JOURNAL, Jan., Feb., Mar., 1930.

For this purpose tarred wire-netting bags, each containing fifty roots, were, after weighing, placed in trios vertically inside the clamp at points represented by the numbers 1, 2, 3 . . . 12. Samples numbered 1, 4, 7, 10 were arranged near the top, numbers 2, 5, 8 and 11 near the side and numbers 3, 6, 9 and 12 near the base.

The beet, forming the main body of the clamp, were drawn as required from consignments being delivered into the factory.

The clamp was earthed up to a distance of 6 in. from the top and remained thus throughout. No straw or other covering was used, as such would tend to interfere with the " cosseting " process in the factory by fouling the knives.

After successive periods of three weeks, each trio of samples was removed and its contents examined. The dates on which this took place were as follows :—

October 30 :	Clamp built.
November 20 :	1st trio removed.
December 11 :	2nd trio removed.
January 1 :	3rd trio removed.
January 22 :	4th trio removed.

It was not considered necessary, in the first instance, to place more bags in the clamp than those mentioned, since they would be ample to cover the period over which clamping would be necessary in agricultural practice. The experiment, therefore, continued over a period of about three months.

Analytical and Other Data Obtained.—To follow the changes in composition, it was thought necessary to obtain the following data :—

(*a*) *Sugar* (*Sucrose*) *Content.*—This was determined both with the polarimeter and also gravimetrically. In the former case it was carried out by the Sach's Le Docte process, using the standard rasp of that time. Since the polarimetric and gravimetric results were so nearly similar, only the former have been quoted in tables of results following.

(*b*) *Reducing Sugars.*—These were determined by standard methods and only recorded when they exceeded 0·2 per cent.

(*c*) *Dry Matter.*—This was determined on the pulp obtained from the rasp, the drying being carried out on five grammes of material for several hours.

(*d*) *Weights of Beet.*—These were obtained for each lot of fifty beet, both before they were enclosed in the clamp and on removal.

The figures referred to as "mean sucrose," "mean dry matter," etc., are those obtained by averaging the results obtained from each separate bag of the trio.

Meteorological Data.—Data referring to the daily temperature changes both outside and inside the clamp were collected. In the latter case readings were taken for the top, side, middle and bottom positions. It was thought that the occurrence of reducing sugars and changes in dry-matter content might be influenced by changes in temperatures.

Table I gives the results obtained for the first season's samples drawn out at different stages of that experiment.

The results from this first series were sufficiently interesting and encouraging to warrant its continuation and elaboration for two further seasons. More reliance could be placed on the results if, at the end of three years, the earlier conclusions could be corroborated. It was felt, however, that the experiment had not sufficiently followed farm conditions, since, by washing and retopping the beet, some degree of artificiality had been introduced. Further, in order to imitate practice still more closely, it would be necessary to examine the experimental beet from the entire vertical section of the clamp and not from the middle, top and bottom only. The revised methods of approach are described in the following two seasons' work.

Experiments of the Seasons 1929–30 and 1930–31.—The experiments of the next two seasons include :—

(*a*) A continuation of the determination of the changes occurring in washed beet in the tarred wire bags placed at different points in the clamp.

(*b*) An examination of the changes taking place in unwashed beet occupying positions at all points on the vertical section of the clamp.

(*c*) A determination of the temperature changes as in season 1928–29.

In the second case (*b*) a clamp of dimensions similar to that of 1928-29 was used, varied, however, by placing vertical, triangular wire cages at intervals in the clamp. In each of these cages were placed about 8 cwt. of well-mixed, unretopped, unwashed beet, for which the average dirt tare had been determined. The cages were constructed of wire-netting drawn round a wooden frame and of the same vertical dimensions as those of the clamp. The width of the cages was about twenty inches, and they were arranged as illustrated in Fig. 2. The wire-netting bags were taken out at the same time as the contents of the adjacent cage.

The procedure for treating the beet for inclusion in the cages was as follows : A large number of sugar-beet, drawn from one delivery and weighing about 3 tons, was thoroughly mixed by

TABLE I.—1928–29.

Bag No.	October 30 (Control)	November 20			December 11			January 1			January 22		
		1.	2.	3.	4.	5.	6.	10.	11.	12.	7.	8.	9.
Weight of beet clamped		33	30	37	36	29	37	34	32	31	42	37	39
Final weight (on removal from clamp)		32	29	36	34·5	26·5	35·5	34·2	31	29·7	41·5	35·7	36
Loss or gain of weight in storage per bag (∓)..			−1·0			−1·8			−0·7			−1·6	
Percentage loss or gain of weight (∓)			−3·0			−5·4			−2·3			−4·0	
Mean sucrose, per cent.	17·03		17·77			17·38			17·38			15·98	
Mean reducing sugar, per cent.	—*		—			—			·24			·37	
Mean dry matter	24·35		25·16			25·34			25·01			24·58	

* Figures for invert sugars not given when falling below 0·2 per cent.

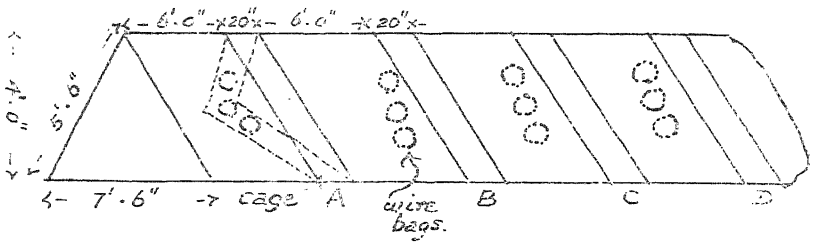


FIG. 2.

turning the beet first into small heaps and then back into a main heap. The process was carried out about six times. Three samples of 50 beet each were drawn from the heap and used as controls (as in the first year's experiment). On these the initial dirt-tare, sugar content and dry-matter determinations were made. The remaining beets were then transferred in weighed quantities into the cages, each cage being placed in position as the clamp was being built up. By the side of each cage were placed two (in season 1930, three) wire bags, each containing 50 washed beets. Building the clamp and the removal of the beet both from the cages and wire bags took place on the following dates :—

1929–30

November 1 :	Clamp built.		
November 19 :	Cage A	Bags	15 and 16.
December 10 :	,, B	,,	1 and 14.
January 1 :	,, C	,,	5 and 4.
January 22	,, D	,,	11 and 13.

1930–31

November 1 :	Clamp built.		
November 27	Cage 5	Bags	1, 2, 3.
December 18 :	,, 4	,,	4, 5, 6.
January 7 :	,, 3	,,	7, 8, 9.
January 29 :	,, 2	,,	10, 11, 12.
February 18 :	,, 1	,,	13, 14, 15.

It will be observed that the clamp for 1930–31 contained one more cage than in the previous year, and permitted the experiment to extend well into February.

On their removal from the clamp, the contents of the wire bags were treated as in the year 1928–29. The roots from the cages were washed, drained and weighed. The difference between the calculated initial weights and the actual weights found at the time of removal were taken as a measure of the changes occurring during storage. The analytical and other data for both years are shown in Tables II and III.

TABLE II.—Wire Bags, Seasons 1929–30 and 1930–31.

	1/11/29	19/11/29	10/12/29	1/1/30	22/1/30	1/11/30	27/11/30	18/12/30	7/1/31	29/1/31	18/2/31
Weight of beet clamped..	start	30 32	39 39·5	48 33	43 35	start	50 39·5 44	46 47 19·5	49·5 44 52	47·5 48 45·5	54·5 63 64·5
Final weight	start	30·5 33·7	40·5 40	48·5 32·5	42·5 34·5	start	48·5 37·5 42·5	45 45·5 18·5	48·5 42·5 49·5	46·5 46·5 45·5	52·7 62·2 63
Mean Loss or Gain in weight in storage (per bag) (∓)	start	+1·1	+1	—	—0·5	start	—1·7	—1·2	—1·7	—0·8	—1·33
Percentage loss of Organic weight (∓)	start	+4·0	+2·5	—	—1·2	start	—3·7	—3·1	—3·4	—1·7	—2·2
Mean sucrose, per cent...	17·96	17·85	17·73	17·93	16·49	14·87	15·60	14·80	14·79	14·89	14·03
Mean dry matter, per cent.	25·38	25·82	25·46	25·73	24·78	22·99	22·70	22·00	22·00	21·57	22·84

TABLE III.—Cages, Seasons 1929–30 and 1930–31.

	1/11/29	19/11/29	10/12/29	1/1/30	22/1/30	1/11/30	27/11/30	18/12/30	7/1/31	29/1/31	18/2/31
Calculated weight of beet clamped (lb. washed beet)	start	955	1,028·5	1040·5	982	—	480	900	827·7	874·5	869·5
Weight of beet on removal	—	932·7	1,010·7	986	987·2	—	481	883·5	815	858·5	882
Loss or gain in storage(∓)	—	—22·3	—17·8	—54·5	+5·2	—	+1	—16·5	—12·7	—16	+12·5
Percentage loss or gain in weight (∓)	—	—2·3	—1·7	—5·2	—	—	+0·2	—1·83	—1·5	—1·8	1·4
Mean sucrose, per cent...	17·96	17·76	17·57	16·87	15·93	14·87	15·11	15·05	14·60	14·49	13·52
Mean dry matter, per cent.	25·38	25·17	25·37	24·63	24·22	22·99	21·55	21·48	21·39	20·88	21·34

In all the determinations shown in Tables II and III the Mean Reducing-Sugar Content was less than 0·2 per cent.

Results Obtained from the Experiments: (1) *Changes in Sugar Content.*—(*a*) Washed Retopped Beet in Wire Netting Bags.—An examination of the data in Tables I, II and III shows that the sugar content fluctuated but slightly over the greater length of time for which the experiments ran. There was, however, a diminution in the sugar content at the end of the periods, particularly after January 1, in the years 1928–29 and 1929–30. In 1930–31 the corresponding diminution did not appear until February.

(*b*) Unwashed Unretopped Beet in Cages.—In both the seasons, 1929–30 and 1930–31, there was a decided tendency for the sugar-content to drop at a much earlier date than in the case of beet stored in wire netting bags. Growth of the lateral buds took place fairly early, and this is thought to be a contributory cause to the more rapid changes. The caged beets in both years finished up with a sugar percentage at least 0·5 per cent. lower than that in the wire bags.

(2) *Changes in the Dry-Matter Content.*—(*a*) Washed Retopped Beet in Wire-Netting Bags.—Table I shows a rough parallel between the changes in sugar and the corresponding dry matter. It is not desirable, however, to state definitely that every change in sugar content is necessarily attended by a related change in dry matter, since the sugar only forms one part of it, and changes in the non-saccharine dry matter may be proceeding at the same time.

(*b*) Unwashed Unretopped Beet in Cages.—An examination of Tables II and III does not suggest that any considerable changes occurred in the dry matter. In fact, although Table II suggests a fall towards the end of the season, no such change is found in Table III.

(3) *Changes in Reducing-Sugar Content.*—In the first season only were any reducing sugars in excess of 0·2 per cent. It is a significant fact that, towards the latter part of December, a much colder spell of weather was experienced in the season 1928–29 than occurred at any period of the other two seasons 1929–30 and 1930–31. This may have contributed to the earlier fall in the sugar content and been attended by a production of reducing sugars. The absence of any definite evidence in the succeeding seasons does not warrant any definite statement on the

relationship between climatic conditions and the production of reducing sugars.

(4) *Changes in the Total Weight of the Beet.*—(*a*) Washed Retopped Beet in Wire-Netting Bags.—In the season 1928–29, there was a loss in weight that became less pronounced towards the close of the season. In the season 1929–30, an initial gain in weight was followed by a steady loss in weight. In 1930–31, there was an initial loss in weight, and this continued until the end of the season. It seems impossible to draw any general conclusions on weight changes from these figures. A possible relationship between dry matter and total weight is suggested in the season 1928–29, when a rise in the former is attended by a loss in the latter (except on January 22).

(*b*) Unwashed Unretopped Beet in Cages.—In neither of the seasons 1929–30 and 1930–31 does the evidence of the figures suggest that any regular change in weight is going on. In fact, the tendency is for the beet to maintain its weight fairly constant throughout the clamping period.

(5) *Temperature Changes.*—Examination of Tables I, II and III in relation to the temperature changes both within and outside the clamp suggests that there may be a relationship between cold conditions and the formation of reducing sugars. In the season 1928–29, when the coldest weather conditions prevailed, and when the temperature inside the clamp approached nearer to freezing point than in either of the two succeeding years, reducing sugars were produced.

Conclusions.—(1) Changes in the sugar-content of clamped beet take place, and are of rather vital interest to the grower. Under the best conditions of carefully retopped beet, some loss takes place after the New Year. With carelessly topped beet, this change takes place at a much earlier date, *i.e.*, about the end of November, and results, finally, in a greater loss than in the case of retopped beet. Farmers who are intending to clamp sugar-beet for a period before despatch to the factory, are advised to pay special attention to the topping, which should be thorough.

(2) It does not appear that any considerable changes in total weight of the beet take place during clamping, at any rate until the middle of February, by which time all beet would normally be delivered.

(3) Taking both factors (sugar-content and total weight) into consideration, it does not seem that the grower will be likely to suffer any serious losses so long as he retops his beet thoroughly, makes a clamp of the dimensions already described, and takes the precaution to earth it up 4 in. or so thick to within about 6 in. of the top.

(4) It is suggested that a possible relationship between a low temperature of the beet in the clamp and the formation of reducing sugars may exist.

Note.—The writers wish to acknowledge their indebtedness to the Allscott Factory authorities for placing labour and all other necessary facilities at their disposal for the conduct of the experiments. They also desire to express their thanks to Messrs. G. H. Botham and G. Owen for assistance on many occasions.

* * * * * *

A REMARKABLE SMALL-HOLDING IN SOUTH WALES

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IN the course of an investigation of some of the factors making for efficiency in milk production, particulars of a somewhat remarkable small-holding were obtained. The holding consists of 18 acres of good grass land situated on a main road, with a very decent cottage and a rather poor set of buildings. There is also a productive but not very large garden. At the time the stock consisted of cows, pigs and poultry, with one working horse. The productivity of the grass land is possibly best indicated by the fact that it affords both pasture and hay sufficient for eight cows and the horse. The chief sales comprised whole milk (collected at the farm), eggs and pigs—mostly sows with litters. The cows were all purchased, and calves were usually sold a week or so after birth, but a few as veal. There were no young cattle on the holding. At first sight the cows might appear a "scraggy" lot; one or more might have a broken horn or other obvious defects in appearance. Closer inspection soon revealed good udders and teats, even though ribs and backs might be a little bare, except just at springtime when the cows first went to pasture, or, in the case of a dry cow, in the autumn. On appearance, it would be judged that the cows had been selected for utility only, but how closely and carefully they had thus been selected could only be revealed after recording their activities.

The rent of the holding, including the house, is £43 per annum, and rates and tithe about £11. The tenant himself

had made some improvements in buildings, nothing of moment, except possibly the addition of pulley and forks to the Dutch barn for unloading hay—a rather remarkable sight on a Welsh small-holding. The family consisted of a man and wife and one son. All the work was done by the family, mainly by the small-holder himself, the wife assisting when necessary, and generally taking an interest in the live stock. After leaving school, the son assisted with the work. A small oil-engine and chaffer, etc., were used.

Milk costing on a "Survey Schedule System" was started on this holding on November 1, 1924, and continued for four years. Monthly records of operations and transactions were obtained throughout the period. It soon became evident that there were remarkable features about this holding and its management. During the first year, there were nominally 8 cows, but owing to an interval in changing cows the herd averaged $7\frac{3}{4}$ cows for the year. These produced over 6,000 gallons of milk, or an average of 780 gallons per cow, at a net cost of about $6\frac{1}{2}d.$ a gallon. The total net cost of maintaining a cow was found to be £21 2*s*. During the second year (1925-26) there were about $7\frac{1}{2}$ cows on the holding throughout the year, but again the nominal 8 cows. They produced nearly 6,200 gallons of milk at a total estimated net cost of £146, or less than £20 per cow and less than 6*d*. per gallon of milk. The yield per cow was about 820 gallons. Actual milk sales reached £275, and the estimated profit on the dairy herd was £113. The herd was of the same size in the third year, but production reached over 6,400 gallons, or 860 gallons per cow. The net cost of maintenance per cow was about £19 or 5*d*. per gallon of milk produced. Some milk had to be fed to pigs in this year, and only 5,800 gallons were sold. The price was also lower, with the result that the balance of profit was only about £60. During the fourth year, the yield was about 6,500 gallons, or 800 gallons per cow, produced at a total cost of £22 per cow, or a little over 6*d*. per gallon.

The total income from this herd, including the estimated balance of profit and the value of labour, charged as an expense of production but receivable by the family,* is as follows :—

* In addition to the value of family labour charged directly to attendance on the dairy cows, a proportion of the cost of the home-grown crops charged to the cows consists of payment for family labour. The total income accruing to the family from the herd would, therefore, be greater by these amounts than is shown above. The only direct charges on the dairy herd, which are outgoings from the farm, are the payments made for purchased foodstuffs, rent and rates on the land, manures and depreciation on herd and equipment. The balance remaining after deducting these from gross returns of the dairy herd is family income, which includes payment for labour, interest on capital and net profit.

	Balance = profit			*Value of labour*			*Direct income from herd*		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
1925-26	112	18	6	39	6	9	152	5	3
1926-27	59	15	9	30	3	6	89	19	3
1927-28	65	12	6	36	7	0	101	19	6

The yield of milk was about 820 gallons per cow actually in the herd each year, but over the last three years the average amount actually sold was 780 gallons each year.

With a herd of this character, it might be expected that there would be high turnover of cows, and possibly some difficulty about regular breeding. Neither of these conditions arose. Table I shows that, in the four years, six cows were sold and six bought.

The average depreciation per cow, 1924-25 to 1927-28, was less than £2 per annum. In 1929, one cow died, and general depreciation and loss on sale was considerable. Over the five years, the loss by depreciation and re-sale was about £2 12*s.* per cow each year.

By this year (1931), cows have been on the holding for the following periods :—

Cows	*Years on holding*
1	8
1	5
2	4
2	2
3	1

It is more difficult to state the position, as regards breeding, when some cows are bought as fresh calvers and others are sold at the most convenient time. Most of the cows were sold in from forward store to fat condition. During the four years, with a nominal 8 cows, 26 calves were sold off the holding. In the last year, when considerable changes in the herd were made, 6 calves were born. The average yield of live calves (per cow in herd) in herds in general is only about 9 per 10 cows or possibly less, so that, for this system, the calf-yield is quite creditable. The average value of calves sold was about £2 10*s.*

The most remarkable feature in the management of this herd of cows is the extremely low feeding compared with the milk yield. This is evidence of high-yield capacity. Cows are usually at pasture from May to October inclusive, and, sometimes, part of April. The average season for day and night pasturage is 6½ months. Milking cows are usually in day and night for 3½ months, and 2 months of winter they

Table I.—Turnover of Cows

	Beginning			Bought			Total bought in			Sold			Depreciation			End of year		
	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.
1924-25 ..	8	206	0	0	1	19	0	0	9	225	0	0	1	22	10	0	26	10	0	8	176	0	0
1925-26 ..	8	176	0	0	2	39	15	0	10	215	15	0	2	38	0	0	8	15	0	8	169	0	0
1926-27 ..	8	169	0	0	—	—			8	169	0	0	1	15	0	0	6	2	6	7	147	17	6
1927-28 ..	7	147	17	6	3	66	15	0	10	214	12	6	2	26	15	0	19	7	6	8	169	0	0
Total ..	31	698	17	6	6	125	10	0	37	824	7	6	6	101	15	0	60	15	0	31	661	17	6
Interval ..	—	—			—	—			1	—			—	—			—	—		—	—		
1929 ..	9	189	0	0	2	40	0	0	11	229	0	0	2*	25	0	0	44	0	0	8	160	0	0
Total ..	40	887	17	6	9	165	10	0	49	1,053	7	6	8*	126	15	0	104	15	0	39	821	17	6

* One died.

are pastured during the day. Dry cows are taken in day and night during the worst winter months.

The average consumption of hay, during the feeding-season from November to April or May, was 25 cwt. or a little more. In one season a little straw-chaff was fed, and in another a few roots. The average consumption of concentrated feeding stuffs was barely $8\frac{3}{4}$ cwt. per cow per annum, or not quite $1\frac{1}{4}$ lb. per gallon of milk. Concentrates are usually fed during the six winter months, but with some regard to needs of individual cows and to milk yield, although no very definite ration was used.

During the seasons in which the concentrates were fed, the average consumption was nearly 3 lb. per gallon of milk.

Winter season	*Concentrates per gallon of milk*
	lb.
1924-25, November-April	2·8
1925-26, November-April	2·4
1926-27, November-April	3·3
1927-28, December-May	2·9

Dairy meals or cakes were mostly used for cows, but some straight meals and a little bran were used on occasions. During the four years, the average price of concentrates was almost exactly £10 per ton—a sign of fairly keen buying for a small herd on a small-holding.

The estimated costs of producing milk are given in Table II.

Table II.—Cost of Milk Production per Cow

	First year			*Second year*			*Third year*			*Fourth year*		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Home-grown food ..	3	19	10	3	14	4	4	8	1	4	14	4
Purchased food ..	4	9	3	4	2	5	5	9	2	5	15	11
Pasturage	6	4	9	6	9	0	6	4	3	6	5	0
Labour	4	9	8	5	5	1	4	1	6	4	10	0
Bull service	0	10	4	0	2	6	0	2	6	0	4	11
Depreciation on herd	3	8	5	1	3	5	0	16	6	2	9	2
Depreciation on equipment	0	10	7	0	9	6	0	8	10	0	7	4
Miscellaneous ..	0	5	2	0	5	0	0	4	0	0	4	11
Gross cost	23	18	0	21	11	3	21	14	10	24	11	7
Credits	2	16	0	2	0	11	2	15	1	2	13	11
Net cost	21	2	0	19	10	4	18	19	9	21	17	8
	Gallons			*Gallons*			*Gallons*			*Gallons*		
Yield	784			823			867			803		
	Pence			*Pence*			*Pence*			*Pence*		
Cost per gallon Gross	7·32			6·29			6·02			7·34		
Net..	6·46			5·69			5·25			6·54		

There were, naturally, some variations in costs from year to year, but none that were really significant of changes in management or results. The "labour" charged is that of attendance on cows, milking, etc. The labour on pastures and on hay is included in the estimates of cost of these items. Feeding in the last year was slightly heavier than usual.

The average net price received for milk was only 9*d.* per gallon with these variations :—

	Price per gallon of milk	
	Net	*Gross*
	Pence	*Pence*
1925-26	10·23	10·87
1926-27	7·75	8·41
1927-28	9·12	9·72

Allowing 0·64*d.* per gallon collection costs (1*d.* or ¾*d.* for winter and ½*d.* for summer), the average net price was 9·04*d.*, and the average gross price was only 9·68*d.* per gallon. This is a very low price for the period, but the district is one in which a great deal of "creamery" milk is bought, and the owners of small herds have few opportunities of finding a better market.

During the calendar year 1929, for which full accounts were kept (*see* Table III), the total capital on the holding was about £305, or £17 4*s.* per acre. The sales, with value of produce consumed, amounted to about £24 per acre, and expenses to £12 per acre. These expenses do not include value of family labour, and there was no hired labour. Throughout the period, the family gave to neighbours, and received from them, assistance in specially busy seasons on an exchange basis.

The value of the family labour given to the holding, and in exchange for assistance on the holding, is estimated (at rates ruling for farm employees in the district) at £146. The gross profit on the holding (including produce consumed) was £210. The balance to be reckoned in the form of profits, covering interest, etc., is £74. The rent of the house is included in the rent of farm as an expense, but the occupation of the house, which is in a fairly desirable situation, may be taken as real income.

The income of the family (three persons) would thus be :—

				£	*s.*	*d.*
Produce consumed				26	0	0
House occupied				10	0	0
Cash—						
Estimated as wages	£146	0	0			
Estimated as cash interest and profits..	38	0	0			
				184	0	0
				£220	0	0

TABLE III.—STATEMENT OF REVENUE AND EXPENDITURE OF SMALL-HOLDING FOR THE YEAR ENDING DECEMBER 31, 1929

	£ s. d.	£ s. d.
To Valuation of stock and produce at the beginning of the year		313 15 4
,, *Payments and expenses*—		
Rent	43 0 0	
Rates	9 1 7	
Tithes	1 18 6	
		54 0 1
Cattle bought (4)		44 0 0
Pigs ,, (2)		2 16 0
Manures		6 10 0
Feeding stuffs		101 13 11
Sundries		2 4 0
Gross profit		210 4 3½
		£735 3 7½

	£ s. d.	£ s. d.
By *Sales and receipts*—		
Cows (2)	25 0 0	
Calves (10)	28 9 0	
		53 9 0
Pigs		31 10 0
Poultry sold (40)		8 0 2
Eggs sold (6,396)		39 6 7
Milk sold		260 12 10½
Sundries		10 5 0
,, *Consumption*—		
Pigs	15 0 0	
Poultry (13)	2 5 6	
Eggs (33 doz.)	2 9 6	
Milk (96 gal.)	6 8 0	
		26 3 0
,, Valuation at end of the year		305 17 0
		£735 3 7½

BALANCE SHEET AS AT JANUARY 1, 1929, AND DECEMBER 31, 1929

LIABILITIES	Opening £ s. d.	Closing £ s. d.
Balance, being capital	313 15 4	305 17 0
	£313 15 4	£305 17 0

ASSETS	Opening £ s. d.	Closing £ s. d.
Dairy cows	189 0 0	160 0 0
Pigs	19 0 0	29 0 0
Horses	10 0 0	10 0 0
Poultry	17 5 0	18 2 6
Crops	24 0 0	42 15 0
Purchased foods	6 15 4	3 0 0
Implements and machinery	47 15 0	42 19 6
	£313 15 4	£305 17 0

Poultry were kept mainly for egg production, and were producing about 100 eggs per bird with good ordinary farm treatment. They were carefully fed and attended, but no special "advanced" methods were used.

As far as could be observed, the pigs were almost continuously profitable on this farm. The small-holder was quite a successful manager of breeding sows, and an adjacent neighbourhood offers a fairly good market for weaners and stores for pork-fattening. A continuous policy of breeding was followed in spite of temporary changes in the markets, and there could be no doubt that the pigs represented an economical enterprise.

The main factor in the success of this small-holding is the sound traditional knowledge of live stock and their needs on the part of both the holder and his wife, but more particularly in the holder's sound knowledge of cows and very keen judgment of their capacities and values. The greatest possible care was taken, and markets were watched in the selection of purchases. There was no haste when a cow was required: she was sought with care and diligence, with the results indicated.

It may be noted with interest that, although the small-holder's knowledge was of the traditional and more practical character, he has found opportunities for his son to obtain technical agricultural education of a formal character. It is greatly to be regretted that this small-holder has since passed away. There is evidence, however, that the holding may be carried on with continued success.

* * * * * *

THE CANNING WORKS OF FOSTER CLARK, LTD., MAIDSTONE, KENT

(National Mark Canners)

THE canning of fruit and peas was first taken up by Foster Clark, Ltd., at Maidstone as recently as 1929, and already the enterprise forms an important branch of the firm's activities. As it manufactures a number of other products, some of which, *e.g.*, jellies, involve the utilization of fruit or fruit juice, the firm is favourably placed for fruit canning on economic lines, since it is able to provide employment for the canning staff in other directions when canning work is slack, such as during bad fruit-picking weather, and to use fruit which is small or very ripe and, therefore, unsuitable for canning. Moreover, it can effect economies in buildings, power and administrative staff.

Raw material is obtained from the important fruit-growing area within a few miles of Maidstone. Fruit is bought from growers at an agreed price, the whole output generally being taken, subject, of course, to its being suitable for canning. Contracts are not made for fruit in advance, but the firm has established friendly relations with a number of growers and can rely on receiving their supplies of fruit, delivery often being made even before the price has been settled.

As regards peas, contracts are made with growers to grow a given area for the factory. The price is fixed at the time of contract on the basis of the yield of vined peas at the factory.

The fruits canned include gooseberries, strawberries, raspberries, black currants, cherries and plums. "Royal Sovereign" is the only variety of strawberry accepted and most of the raspberries canned are "Lloyd George."

The main aim of the Company is to ensure that fruit is canned absolutely fresh. All fruit is, therefore, canned the same day as received. Growers deliver the fruit direct into the workroom after a preliminary examination by the factory manager to judge its suitability. There is no store room for fruit at the factory. Supplies are stacked as received at one end of the workroom and the staff is generally so far on top of its work that there is usually no more than an hour or so's supply of fruit in hand. It is here that the firm has the advantage of engaging in other activities, which enables it to switch the workers over to another job if supplies of fruit give out. If it were always necessary to have on hand a reserve of supplies for canning, the required degree of freshness could not be so easily maintained.

Another practice of the company, in ensuring that fruit is received in good condition, is to steam-sterilize all returnable empties. Moulds and bacteria that might otherwise infect the next consignment of fruit are thus destroyed. Before being returned to growers, empties so treated are marked with a special tape and no fruit is accepted unless in containers bearing this mark.

Before canning, the fruit is graded for quality and, where necessary, for size. In the case of plums, the fruit is roughly size-graded by a mechanical grader. The grading is carried out by girls over a number of 40-ft. travelling grading belts which run in pairs across the grading room (Fig. 1). Each pair of belts employs about 40 girls. Foreign matter and damaged or otherwise unsuitable fruit are removed, and where the fruit needs to be graded for size this is done by sorting each size-grade on to a separate moving belt. At the end of each belt are stationed supervisors, who examine the fruit passing before them and ensure that only perfect fruit is filled into the cans. Seven of these pairs of grading belts are at present kept in operation during the canning season, and about 300 workers are thus employed.

Gooseberries are machine "snibbed" and black currants are machine "strigged" before they pass over the sorting tables. Machine-strigging of black currants results in a greater percentage of spoilage than careful hand-strigging, but the extra loss is more than counterbalanced by the saving of labour.

The sorted and graded fruit is delivered by the travelling bands direct into the cans. The company has devised a special arrangement of belting for automatically delivering the filled cans from each grading belt to a single point (Fig. 2). A girl seated at the end of each grading belt attends to the filling of the cans. Cans are placed beneath the delivery spouts fed by the grading belts and, as filled, are pushed forward on to another travelling belt moving at right angles. The filled cans are thus conveyed on to a platform from which they are collected. With one movement, the filled can is thus removed and its place taken beneath the delivery spout by an empty one.

The whole of the grading plant is steam-sterilized daily.

The cans, after being filled with fruit, are removed to be subjected to five consecutive operations: (*a*) filling with syrup; (*b*) exhausting; (*c*) sealing; (*d*) cooking; and (*e*) cooling.

These are carried out as part of one continuous automatic and synchronized process (Fig. 3). The machinery, except the seamers, is of British manufacture and of standard types.

The cans of fruit are fed by hand on to the syrup-filling machine, which automatically delivers the required quantity of hot syrup of a known density into each can, a valve device shutting off the flow of syrup when it reaches the required level.

From this machine, the syrup-filled cans pass on to a wide, slowly-moving metal band which takes them slowly through the "exhaust box." In the "exhaust box," the conveying band sags sufficiently to plunge the cans almost up to the mouth in boiling water. The result is to expel the air from the cans, the head of the can and a "mushroom" of space around its mouth being filled with hot water vapour. Exhaustion of air should be as complete as possible in the production of a pack that will stand for years without deterioration, and every effort is made to ensure, by a long exhaust period, a satisfactory "vacuum." The length of the exhaust period and the temperature of the "exhaust box" can be increased according to the kind of fruit being canned.

On emerging from the "exhaust box," the cans are conveyed to the seamer, which seals on the lids by a system of rollers (no solder is used) at a rate of over 4,000 per hour.

The cans are then taken by a slowly-moving band into the cooking chambers, which are of the "variable outlet" type, *i.e.*, the length of cook and sterilization can be varied for different fruits by simply arranging for the delivery of the cans at one or other of the numerous "doors" provided throughout the length of the cooker. Efficient sterilization is absolutely essential, otherwise ferments or bacteria would set up decomposition, resulting in "blown" cans. After cooking, the cans are rapidly cooled; if this were not done, they would, of course, continue to cook.

Garden-peas pass through a slightly different process from that to which fruit is subjected. The green peas on the vine are thrashed and roughly "winnowed" in a special "viner" and are graded for size by means of a cylindrical rotary-drum perforated in various diameters. They pass through a rotary hot-water "blancher," and are then hand-sorted on travelling belts. From these, they are automatically delivered by means of an elevator to the hopper of a filling machine (Fig. 4). Empty cans are simultaneously conveyed by a gravity conveyor to the delivery spout of this machine and are

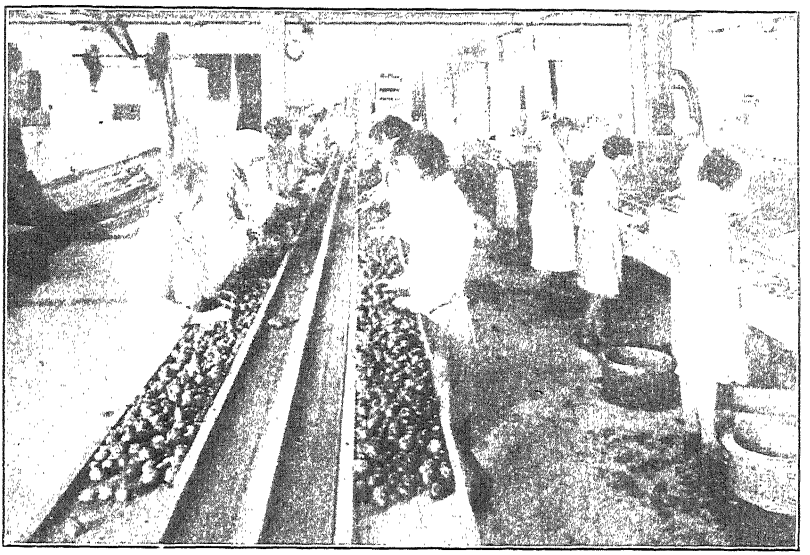


FIG. 1.—The grading room, where the fruit is hand-graded for quality.



FIG. 2.—Automatic delivery of the graded fruit to the cans by the special arrangement of travelling bands devised by the firm.

THE CANNING WORKS OF FOSTER CLARK, LTD.

To face page 824.

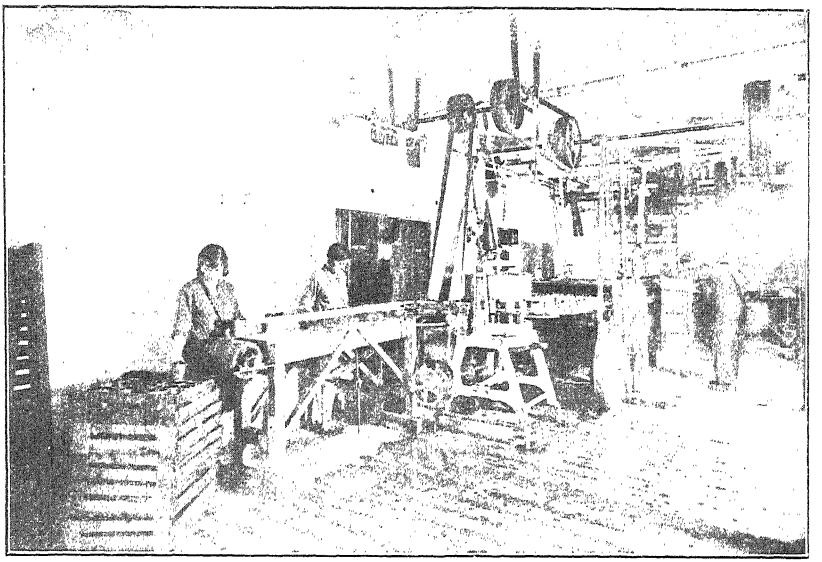


FIG. 3.—View of the continuous automatic and synchronized process plant by which the filled cans are filled with syrup, exhausted, sealed, cooked and cooled.

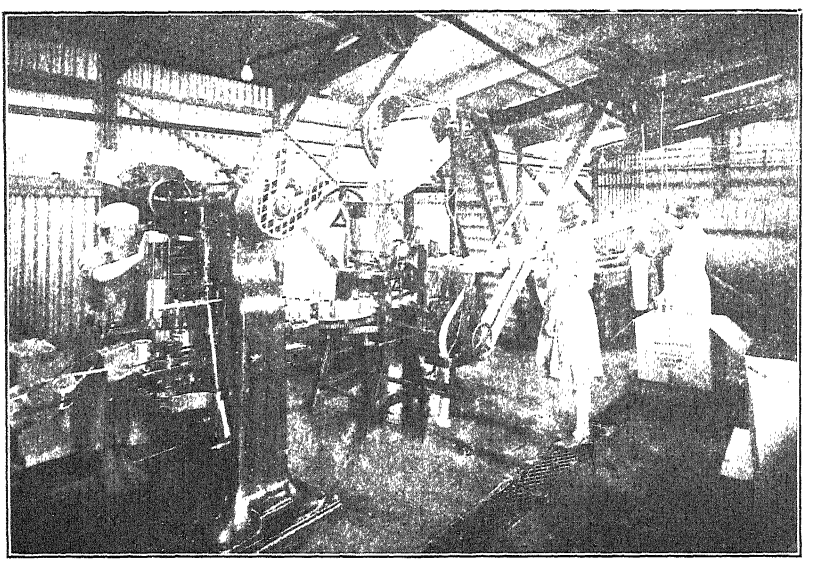


FIG. 4.—View of the elevator for the automatic delivery of green peas from the hand-sorting belts to the hopper of a can-filling machine.

filled automatically with the required quantity of peas. Subsequently, the cans are filled with brine and then pass through an "exhaust box" and are seamed as in the case of fruit.

Vegetables, for various reasons, require a longer "cook" and sterilization at a higher temperature than fruit; and the sealed cans are, therefore, placed in cages and lowered into retorts of the autoclave type, where they are cooked for some 30 minutes under pressure at about 240° F. From the time the peas are sorted on to the belts and the empty cans are placed on the gravity conveyor until the filled and sealed cans are taken to the cooker, neither peas nor cans are touched by hand; the processes are automatic.

After cooling and labelling, the cans of fruit or peas are ready for dispatch, but it is usual for the cans to be stacked for a few weeks before sale to allow "blown" cans due to defective sealing and ineffectual sterilization to reveal themselves.

The company owns the printing works where its can labels are printed.

An important feature of the canning works is the system of laboratory control designed to ensure the correct condition of the produce throughout the process, constant tests being made of such factors as the strength of syrup, degree of "vacuum," correctness of cook, and appearance and colour of the finished product. It is no exaggeration to say that the high quality that is essential to canned goods bearing the National Mark could not be maintained without this system of laboratory control.

* * * * * *

MARKETING NOTES

National Mark Eggs.—In September, the total output of the National Mark Egg-Packing Stations was returned as 23·7 million eggs, of which 19 million were packed under the National Mark, representing an increase of 58 per cent. over the quantity packed under the Mark in September, 1930. During the first nine months of this year, the National Mark output has been 45 per cent. greater than during the corresponding period of 1930.

Approximately 20 per cent. of the National Mark output this year has passed through the hands of the accredited agents of National Mark Egg Central, Ltd. While it is recognized that these supplies are in the main the packers' surplus, after direct outlets have been satisfied, the operations of the Company have unquestionably had a steadying effect upon egg prices generally. The Company has been giving careful consideration to its sales policy during recent months and there is good reason to believe that the outcome will be a strengthening of the organization and the handling of larger quantities of National Mark eggs.

The seasonal shortage at this period of the year not only has the effect of forcing up the price of home-produced eggs generally, but results in a wider price margin between National Mark and other eggs. The following prices show the state of the market about the middle of October :—

WHOLESALE PRICES PER LONG HUNDRED (120)	
National Mark "Specials" ..	21*s.*
National Mark "Standards" ..	20*s.* 6*d.*
English Ordinary	17*s.* 6*d.*—18*s.* 6*d.*
Dutch 16 lb.	13*s.* 3*d.*—13*s.* 9*d.*
Danish 15½ lb.	13*s.* 3*d.*—13*s.* 9*d.*

The margins in favour of National Mark supplies are evidence of the commercial value of the guarantee conveyed by the Mark.

The general tone of optimism in the home egg trade is reflected in the large number of inquiries that have been received by the Ministry from producers and others who are realizing the value of standardization in marketing and are contemplating enrolment in the National Mark Egg Scheme. Further evidence of the increased attention to standardization is given by the number of producers who now candle their supplies and grade them to the statutory grades before sale.

The maintenance of the reputation of the Mark is fundamental to the success of the National Mark Scheme, and,

by means of the Ministry's inspection service, close oversight is kept upon the quality of supplies packed under National Mark labels. In the event of serious failure by an authorized packer to comply with the requirements of the Scheme, the National Mark Committee is called upon to exercise its powers ; one packer has had his authorization revoked by the Committee during the past month. Action of this kind is happily rare, but the Committee's action shows their determination to uphold the integrity of the Mark in the interests of all concerned.

National Mark Dressed Poultry.—The output of the packing stations during the month of September was approximately 15,000 birds, of which about 9,000 were packed under National Mark labels. The totals for the period January-September, 1931, are approximately 96,000 and 54,000, respectively.

These figures in themselves do not adequately represent the advance that is being made by the National Mark Poultry Scheme. Considerable interest in the scheme has been aroused among progressive producers, and a number of packing units are likely to be enrolled as soon as they are able to comply with the Ministry's requirements respecting equipment and other items. It is evident, however, that there is difficulty in most districts in obtaining adequate supplies of suitable birds. To operate economically, a packing station needs continuity of supplies of the type of poultry in demand for table purposes, and the present situation clearly calls for combination to that end on the part of producers. The establishment of efficient packing stations would improve the net returns of the producer, as, under existing conditions, dealers require a wide trading margin to protect themselves against possible losses from badly-raised birds whose defects are not always obvious at the time of purchase.

It is a hopeful sign that there is a growing appreciation on the part of producers of the advantages of working through a National Mark packing station.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during September, 1930, and September, 1931, and the number of sides graded and marked for the four weeks ended October 17, 1931, were as follows :—

			Number of sides
		LONDON	
Weekly average	..	September, 1930	1,622
,, ,,	..	,, 1931	1,687
Week ended	..	September 26, 1931 ..	1,581
,, ,,	..	October 3, 1931	1,622
,, ,,	..	,, 10, 1931	1,647
,, ,,	..	,, 17, 1931	1,713
		BIRKENHEAD*	
Weekly average	..	September, 1930	846
,, ,,	..	,, 1931	174
Week ended	..	September 26, 1931 ..	112
,, ,,	..	October 3, 1931	172
,, ,,	..	,, 10, 1931	160
,, ,,	..	,, 17, 1931	231
		SCOTLAND*	
Weekly average	..	September, 1930	2,484
,, ,,	..	,, 1931	1,061
Week ended	..	September 26, 1931 ..	1,116
,, ,,	..	October 3, 1931	1,020
,, ,,	..	,, 10, 1931	1,131
,, ,,	..	,, 17, 1931	1,103
		TOTAL LONDON SUPPLIES (All Sources)	
Weekly average	..	September, 1930	4,952
,, ,,	..	,, 1931	2,922
Week ended	..	September 26, 1931 ..	2,809
,, ,,	..	October 3, 1931	2,814
,, ,,	..	,, 10, 1931	2,938
,, ,,	..	,, 17, 1931	3,047
		BIRMINGHAM	
Weekly average	..	September, 1930	188
,, ,,	..	,, 1931	670
Week ended	..	September 26, 1931 ..	680
,, ,,	..	October 3, 1931	698
,, ,,	..	,, 10, 1931	731
,, ,,	..	,, 17, 1931	755
		LEEDS	
Weekly average	..	September, 1931	490
Week ended	..	September 26, 1931 ..	460
,, ,,	..	,, 3, 1931 ..	474
,, ,,	..	,, 10, 1931 ..	470
,, ,,	..	,, 17, 1931 ..	492
		BRADFORD	
Weekly average	..	September, 1931	397
Week ended	..	September 26, 1931 ..	410
,, ,,	..	October 3, 1931	433
,, ,,	..	,, 10, 1931	426
,, ,,	..	,, 17, 1931	430
		HALIFAX	
Weekly average	..	September, 1931	99
Week ended	..	September 26, 1931 ..	83
,, ,,	..	October 3, 1931	114
,, ,,	..	,, 10, 1931	107
,, ,,	..	,, 17, 1931	121

*Sides consigned to London.

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

Grading figures for Islington for the four weeks ended September 26, 1931, showed a rise of 250 sides over the corresponding period of 1930. Although the cold and wet season has made it difficult for graziers to finish their cattle this year, ample supplies of home-killed beef of the higher grades are now becoming available, and there was a marked fall in wholesale meat prices during September. Prices have now become steadier, but they remain at a comparatively low level.

No material change occurred in the proportion of Scotch National Mark beef supplies at Smithfield in September. The number of Scotch sides marked with private marks remained small, but there was a large amount of unmarked Scotch beef on the market. One result of this gap in marked supplies is that large numbers of Canadian cattle of excellent quality now being slaughtered at Birkenhead are being dressed Scotch fashion and offered unmarked on the London market, where the beef competes with the Scotch product.

The upward movement in the Birmingham figures continues. In September, the number of sides graded and marked reached the record figure of 2,871. This figure exceeds by 457 the previous record of 2,414 sides graded and marked during March, 1930.

The number of sides graded and marked in the Leeds-Bradford-Halifax area in September also showed an improvement on the August figures.

A number of consignments of cattle have now been received at Birmingham under the experimental arrangements for the sale of cattle on a grade and dead-weight basis. On September 19, a load of Hereford cattle from H.M. The King's farm at Sandringham was received and disposed of under these arrangements.

The Committee recently appointed under the Chairmanship of Lord Kirkley to review the progress of the National Mark Beef Scheme held five meetings up to September 30, and heard oral evidence from a number of witnesses.

National Mark Apples and Pears.—Despite this year's unfavourable weather conditions, which were expected to have adverse effects upon the quality of the apple crop and to reduce the quantity of high-grade fruit available for packing under the National Mark, there are fair supplies of National Mark apples and pears on the market. These are meeting with an excellent demand and are an encouraging indication of the

steady progress that is being made in the technique of fruit production and marketing in this country.

The following growers have been authorized in the National Mark Apple and Pear Scheme in addition to those recorded in recent issues of the JOURNAL :—

Apples	
Cambridgeshire	E. Metcalfe, Ramleigh House, Haddenham.
	T. Metcalfe, Mec House, Haddenham.
Essex	G. C. Addy, Mayland, Chelmsford.
	J. R. Colthorpe, "Hillside," Inworth, Kelvedon.
Kent	W. F. Gaskain, Dargate House, near Faversham.
	Kent Farm Institute, Borden, Sittingbourne.
Sussex	J. B. Fell, Hulls Farm, Pulborough.
Pears	
Worcestershire	Messrs. Bomford & Hughes, Harvington Lodge, near Evesham.

National Mark Canned Fruit and Vegetables.—The list of authorized canners has been further extended by the enrolment of the following firms :—

T. W. Beach & Sons, Hanworth and Evesham.
M. Walker, Exeter Street, Derby.

The number of canners enrolled in the scheme is now 30, and these firms are operating 38 factories. The majority of the 15 firms who are participating in the scheme for the first time during the 1931 canning season are old-established firms in the trade.

While there has been a further large increase in output during this season—some firms having trebled their production—the demand for National Mark canned fruits and vegetables is still greatly in excess of supply. For example, one factory canning fresh peas reported the sale of their whole season's pack in *one afternoon*, while most factories have already sold the bulk of the 1931 pack. Producers have yet to realize that an important new market is developing before their eyes—a market in which the contract system operates. The uncertainties that have been so disheartening a feature of the fruit industry are, therefore, much reduced.

Few National Mark fruit and vegetable canneries have yet run at maximum capacity, mainly owing to shortage of supplies, and it is clear that the future progress of canning in this country depends almost entirely upon the extent to which growers will interest themselves in producing for this new industry.

National Mark Wheat Flour.—The following firms have recently been enrolled as authorized packers :—

James and John Graham, Market Square, Penrith.
Thos. Leighton & Son, Kendal.

A. H. Oliver & Sons, Central Café, New Tredegar, Mon.
Richardson & Preece, Great Square, Braintree.
Vye & Sons, 64 Queen St., Ramsgate.

Reports show that the new season's wheat crop has been coming on the market rather slowly, partly owing to unfavourable harvesting conditions and partly to uncertainty in regard to the price position. Some authorized millers have, therefore, experienced difficulty in securing suitable parcels of wheat for the manufacture of National Mark flour. The quality of the wheat samples on offer has varied considerably, but the samples of National Mark flour made from this season's crop, which have so far been examined, compare favourably with those of the previous crop. The customary baking tests are being put in hand and the results will be published as soon as they are available.

Marketing Demonstrations.—Demonstrations were staged during October as follows :—

Dairy Show	Agricultural Hall, London	Oct. 20-23	Cheese, Honey and National Mark Display.
Holland County Potato Show	Spalding	Oct. 29	Organization of Potato Marketing.

Displays of National Mark and other Home Produce.—The Empire Marketing Board shop at Palatine Buildings, The Promenade, Blackpool, was occupied by the Ministry during the fortnight ended October 10 for the purpose of the display and sale of samples of English National Mark produce. During this period, the illuminations carried out by the authorities caused a large influx of visitors to the town from all parts, and large numbers of people visited the shop. Keen interest was shown in the display and the Ministry's staff were kept busy explaining the objects and operation of the National Mark schemes. More than 18,000 samples of National Mark products were sold, including eggs, apples and pears, canned fruits and vegetables, tomatoes, flour, and malt extract.

National Mark displays were also staged at the South Wales Grocery and Allied Trades Exhibition at Cardiff (Oct. 5-15) and at the Norwich and Eastern Counties Grocery and Allied Trades Exhibition at Norwich (Oct. 7-17). A display of National Mark goods was included in the Woolwich Health Week Exhibition (Sept. 28-Oct. 3).

Publicity for National Mark Produce.—In association with the Ministry's displays of National Mark products at the

South Wales Grocery and Allied Trades Exhibition at Cardiff (Oct. 5-15), and at the Norwich and Eastern Counties Grocery and Allied Trades Exhibition at Norwich (Oct. 7-17), National Mark Shopping "Weeks" were held in those cities. At both centres, local arrangements were in the hands of special committees of traders and others, and activities included shop-window display competitions open to retailers stocking National Mark products, competitions for the baking of bread and cakes with National Mark flour, and film displays and essay-writing competitions for senior school-children. At Norwich, the Norfolk Federation of Women's Institutes and the Norfolk and Norwich Branch of the National Council of Women organized a National Mark flour cookery competition for housewives. The Ministry advertised National Mark products in the local newspapers, on hoardings, and in 'buses and trams. For the Cardiff "Week," the *Western Mail* newspaper issued a special supplement to which the Minister of Agriculture contributed a personal message. The Norwich and Eastern Counties Grocery Exhibition was opened on October 7 by Sir Charles Howell Thomas, K.C.B., C.M.G., Permanent Secretary to the Ministry.

During October, National Mark beef was again advertised in the Birmingham, Leeds and Bradford newspapers, and in the *Meat Trades Journal*; National Mark fruit in the trade press; flour and canned fruit and vegetables in the trade press and in women's journals. National Mark beef, eggs and cider were advertised during the past summer by means of side streamers on London omnibuses. This medium is now being employed to advertise National Mark beef and canned fruits and vegetables.

Instances are constantly coming to notice where retail traders consider it worth their while to incur expense in advertising the fact that they sell National Mark products. Among these may be mentioned a large co-operative society in Halifax that recently inserted advertisements of National Mark beef in a local newspaper.

A new leaflet (Marketing Leaflet No. 22B) on the subject of National Mark cider has been issued by the Ministry; it contains a number of recipes for the making of cider cup. Copies of the leaflet may be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

At the Ministry's displays of National Mark products, prominence has been given, by means of posters and in other

ways, to the Prime Minister's appeal that, in the present national emergency, preference should be shown for the products of British labour. A circular letter has been sent to all authorized packers under National Mark schemes as follows :—

Reference No. :—M.D. 308/C.L. *7th October*, 1931.

CIRCULAR LETTER TO AUTHORIZED PACKERS UNDER NATIONAL MARK SCHEMES

Dear Sir(s),

The National Mark and the National Crisis

The Prime Minister's recent appeal for preference to be given to the products of British labour in order to assist in rectifying the adverse balance of trade, has doubtless come to your notice. The Ministry feels that, so far as the National Mark scheme is concerned, the present situation provides both its justification and its opportunity.

Every chance is, therefore, being taken to emphasize the Prime Minister's appeal in its special application to National Mark products, and to point out that, by buying them, the housewife is not only getting the genuine home-produced article but she is doing something to assist progressive farmers, growers and food manufacturers in an effort to enlarge their share of the home market through up-to-date methods of grading, branding and publicity.

The Ministry hopes that authorized packers will themselves do everything possible to further the interests of the National Mark scheme in present circumstances, and in particular would welcome their co-operation in securing the widest possible distribution and use of display posters and cards among retailers of National Mark products. The Ministry is always pleased to supply display material to authorized packers for distribution to their retail customers.

Yours faithfully,

A. W. STREET.

Reference was made in the September issue of this JOURNAL to a proposed experimental canvass in certain towns in Lancashire and in Scotland on behalf of National Mark canned fruits and canned vegetables, under the joint auspices of the Empire Marketing Board, the Department of Agriculture for Scotland and the Ministry. In view of the urgent need for economy in public expenditure, the Empire Marketing Board has been reluctantly obliged to abandon this proposal, owing to the reduction in the funds at its disposal.

Loans to Co-operative Marketing Enterprises.—Since 1924, provision has been made annually by Parliament to enable the Ministry to make loans, on security, to agricultural co-operative enterprises registered under the Industrial and Provident Societies Acts and engaged in the preparation and marketing of agricultural produce. The purpose of these loans has been to assist societies in the acquisition of land, buildings, machinery, plant and equipment. In the issue of

this JOURNAL for February, 1931 (p. 1132), a statement was given showing that loans, amounting in all to £50,170, had been granted to 13 societies since the scheme was instituted. Since February, 1931, further loans amounting to £5,328 have been granted to the following two societies :—

Name of society	*Amount of loan*	*Period*
Yorkshire and Northern Wool Growers, Ltd.	£3,500	10 years.
Midland Wool Growers, Ltd.	£1,828	10 years.

The urgent need for economy during the present financial emergency has led to a decision that no further loans shall be made under this scheme during the remainder of this financial year, and no provision is being made in the Ministry's estimates for loans during the financial year 1932.

Grading of Ware Potatoes : Excess of Mould.—The Ministry has recently had a complaint from a prominent association of retailers pointing out that ware potatoes contain an excessive amount of mould, and that this fact has an unfavourable reaction on the demand for home-grown supplies. In one instance, it is stated, the mould amounted to 8½ lb. in a reputed half-cwt. bag.

Statutory grades for ware potatoes under the Agricultural Produce (Grading and Marking) Act, 1928, were promulgated in 1929 with the object of overcoming this difficulty. The prescribed definition of quality limits the amount of earth and other extraneous matter to a maximum of 4 per cent. up to November 1, and 2 per cent. thereafter, with a maximum total aggregate of 5 per cent. for all defects, including diseased, damaged and undersized potatoes.

It is open to retailers and buyers for public institutions, etc., to make their purchases on the basis of these statutory grades.

Irish Free State : Agricultural Produce (Potatoes) Act, 1931.—This Act is mainly designed to maintain and enhance the reputation of Irish potatoes in other countries, although the Minister is empowered to make regulations, which must be approved by both Houses of Parliament, for the grading and packing of *all* potatoes and for the certification of seed.

The effect of the Act is that practically all the ware and seed potatoes for export will have to be graded, packed, marked and inspected according to the regulations of the Irish Free State Minister of Agriculture. It is proposed that the packages should be so marked as to show (i) the identity

of the packer and exporter, (ii) the date of grading and packing, (iii) the kind and grade of the potatoes and the soil on which grown, and (iv) that the potatoes have been grown within the Irish Free State. Each package will bear an official seal or fastener, and when packages are combined in one lot, each consignment will be accompanied by an official consignment certificate. Consignments not exceeding 5 cwt., small trans-border transactions and the re-export trade are to be exempt from the regulations. Further, the Minister may order that the export regulations shall not apply during a part or the whole of the period from June 1 to August 31 in any year.

It is proposed to administer the measure by confining the export of potatoes to holders of licences issued by the Minister. Before an exporter can be entered in the register of potato exporters, he must satisfy the Minister that he is the owner of suitable premises and equipment for grading and packing potatoes and is competent to fulfil the requirements laid down.

Two kinds of registered exporters are contemplated. A "general" export licence will be issued to owners of registered premises at which potatoes not necessarily grown by themselves can be graded and packed for export, or a grower may be granted an export licence applicable only to potatoes grown by himself. The "grower's" licence will only be granted if he is the owner of registered premises and if he is an exporter of potatoes grown by himself and does not export more than 100 tons of potatoes in one year. It is proposed that, for a general export licence, the registration fee shall be £25 and, for a grower's licence, £5.

The premises, operations and stocks of all licence-holders will be inspected, and inspection fees, fixed by the Minister on a tonnage basis, will be charged. Licencees will be liable to have their authority to export revoked if such fees are not paid after one month following the day on which they fall due. Provision is also made for the inspection of warehouses, docks, etc., and of the premises and vehicles of commercial carriers. A general licence may be cancelled if less than 500 tons of ware potatoes or 250 tons of seed potatoes have been exported in one year.

The Minister is also empowered to grant a special licence to enable a grower to export a particular consignment of potatoes grown by himself. These licences will only apply to a specified consignment and may be cancelled at short notice before the lot in question is actually exported. Potatoes

exported under this arrangement will have to be inspected for grading, packing and marking in the usual way.

Dutch Bacon Control Association.—Reference has previously been made in these Marketing Notes (see issue of the JOURNAL for July, 1930, pp. 365-6) to the Netherlands Ministerial Decree issued in 1930—under the Agricultural, Horticultural, Cattle-Breeding and Dairy Products Export Regulation Act, 1929—which provided for the setting up of a bacon control organization for the inspection and marking of bacon for export.

This Decree came into force in February of this year and, as a result, the Dutch Bacon Control Association (Nederlandsche Baconcontrôle) was recently constituted. This body, membership of which is limited to the owners of properly organized bacon factories, has drawn up regulations, which have been approved by the Netherlands Minister of Agriculture, governing the preparation, quality, grading, marking and packing of bacon exported to Great Britain. Any bacon that does not conform to the standards laid down in these regulations must not be marked and the export of such bacon is prohibited. Only members of the Association are allowed to apply the mark, which incorporates the number of the factory with the words "The Netherlands," and, in addition, indicates the grade of the bacon—either "Best" or "Good."

The Board of the Association consists of three independent members, including the Chairman, nominated by the Minister of Agriculture, and two members elected by the bacon curers. All regulations drawn up by the Board require the Minister's approval before becoming operative. The Board is responsible for the issue of marking stamps to affiliated members and has power to fine or suspend any member who fails to comply with the regulations of the Association.

Southern Rhodesia: Maize Control.—The Maize Control Act, 1931, provides for the setting up of a Maize Control Board in which should be vested, as from June 1, 1931, all maize and maize-meal held by any producer save such as might be required for consumption by himself and his establishment, and all maize and maize-meal in excess of 15,000 bags held by any trader-producer or dealer on that date, other than that required to complete a contract made before April 3, 1931, and registered as provided. Imports of maize or maize-meal beyond the domestic requirements of the importer's own establishment also vest in the Board.

The members of the Board number 10, comprising an official member (to be Chairman), a member of each of the Chambers of Commerce of Bulawayo and Salisbury, a consumers' representative and a representative of the Maize Growers' Association—all nominated by the Minister—together with five representatives of duly registered maize co-operative societies.

Produce is to be delivered to the Board, or dealt with as it directs, and the Board may grant advances and also make disbursements on account of a producer, dealer or trader, final payment being made after the annual closing of accounts. The Board may borrow on the security of the produce vested in it; and, in the event of an adjoining State having similar provision for the vesting of the product in a Board, may agree with that Board to vest the produce of both States in a Joint Board. The Governor may make regulations regarding the registration of producers and dealers and the returns to be made by them, the inspection and general control of the products marketed, and the exemption from the provisions of the Act of any maize produced in any area.

The Act expires on May 31, 1934, unless re-enacted.

Beet Sugar Industry in Great Britain. 1930 - 31 *Campaign.*—A summary is given below of the revised results* for Great Britain of the 1930-31 beet-sugar manufacturing season as compared with the previous year. The record acreage gave a record production both in the field and the factory. The acreage under sugar beet and the tonnage of beets delivered to the factories showed an increase of just over 50 per cent. compared with 1929-30, but, owing to the reduction of 1 per cent. in the average sugar-content of beets, the increase in the total production of sugar was somewhat less (45 per cent.).

	1930-31	1929-30
Acreage under sugar beet	348,920	230,531
Average yield per acre (tons)	8.8	8.7
Number of beet growers	40,415	32,204
Number of factories	18	19
Average number of days worked	111	91
Number of workers employed in factories during the campaign	9,900	8,889
Tonnage of beets delivered to factories	3,060,498	2,003,586
Average sugar-content of beets (per cent.)	16.7	17.7
Average price paid per ton of beet	49*s.* 10*d.*	52*s.* 11*d.*

*Certain of the figures relating to the 1930-31 campaign published in the Report on the Sugar Beet Industry (Economic Series No. 27) were only provisional.

	1930-31	1929-30
Estimated total sum, including cost of transport, paid by the factories to the growers	£7,626,000	£5,301,000
Total production of sugar (cwt.)	8,485,965	5,841,489
Average extraction of sugar expressed as a percentage of beets delivered to factories	13.9	14.6
Average extraction of sugar expressed as a percentage of total sucrose in beets	83	83
Average farm output of sucrose per acre of beet grown (lb.)	3,289	3,440
Average factory output of commercial sugar per acre of beet grown (lb.)	2,724	2,837
Production of by-products :—		
Molasses (cwt.)	*2,118,000	1,480,051
Pulp, Dry (tons)	199,964	138,145
Wet (tons)	63,695	21,212
Subsidy paid :—		
Sugar	£5,512,875	£3,794,288
Molasses	*£629,000	£439,488
Total	* £6,141,875	£4,233,776

*Subject to slight adjustment.

1931-32 *Campaign.*—According to the preliminary returns for June 4, 1931, the acreage under sugar beet this year was estimated at 234,400 acres, a figure which, although substantially less than last year's record acreage, is still higher than that for any year except 1930. The decrease compared with last year is approximately 33 per cent., and is largely attributable to the reduction in the rate of subsidy payable under the British Sugar (Subsidy) Act of 1925 upon the commencement of the third and last subsidy period on October 1, 1931. It is of interest to note that the reduction in subsidy at the beginning of the second subsidy period in 1928 was accompanied by a fall in the acreage under sugar beet from 232,918 acres to 178,047 acres, a reduction of about 24 per cent.

Returns received by the Ministry from the beet-sugar factories show that no sugar was manufactured from home-grown beet during September, 1931. In the 1930-31 campaign, the factories were able to make an early start and nearly 200,000 cwt. of home-grown beet sugar were manufactured in September, 1930.

The British Sugar Industry (Assistance) Act, 1931 : Certified Prices.—This Act provides for the payment to certain beet-sugar companies of special advances (contingently repayable) in respect of sugar manufactured from home-grown beet during the 1931-32 campaign. The rate of the advance in any week depends upon a certified average raw cane-sugar price for the previous fortnight, determined in accordance with the British Sugar Industry (Assistance) Regulations, 1931.*

*Statutory Rules and Orders, 1931, No. 789.

Below are given the average prices certified by the Minister for the periods specified, and the corresponding rates of advance per cwt. of beet sugar of a polarization exceeding 98°.

Certified average price per cwt. of raw cane-sugar. *Fortnight ended*	s.	d.	*Rate of advance per cwt. of ex 98° beet-sugar.* *Week of manufacture ended*	s.	d.
September 26, 1931 ..	5	10½	October 3, 1931 ..	1	3
October 3, 1931 ..	6	5	,, 10, 1931 ..	1	3
,, 10, 1931 ..	6	7¼	,, 17, 1931 ..	1	2
,, 17, 1931 ..	6	8½	,, 24, 1931 ..	1	1
,, 24, 1931 ..	6	7	,, 31, 1931 ..	1	2

* * * * * *

LICENSING OF STALLIONS UNDER THE HORSE BREEDING ACT, 1918

THERE was again, in 1931, practically no change in the number of stallions licensed under the Horse Breeding Act in England and Wales, the number of licences issued for the 1931 travelling season being 1,432 as compared with 1,430 for the previous season.

Number of Stallions Licensed in England and Wales

Service Season	1925	1926	1927	1928	1929	1930	1931
Shires	953	829	772	720	760	752	761
Other heavy horses	350	324	328	313	329	335	342
Light horses (including ponies)..	546	455	437	381	347	343	329
	1,849	1,608	1,537	1,414	1,436	1,430	1,432

The number of heavy stallions licensed was increased by 16 to 1,103, while light stallions showed a decrease of 14 to 329. The increase in heavy stallions was in Shires and Percherons, the former numbering 761 against 752 in 1930 and the latter 48 against 42. Clydesdales were unchanged at 128, while Suffolks showed a decrease of 5 to 134. Hackneys, which declined by 6 to 26, and ponies, which showed a decrease of 12 to 85, were mainly responsible for the reduction in the number of light stallions licensed. As regards Thoroughbreds, the steady increase in the number that has been recorded in each year since 1926 was maintained, the year's figure of 188 being larger than in any previous year since the Act came into force.

Licences were refused by the Ministry in respect of 38 stallions as against 42 in 1930. Appeals against refusals numbered 11, an increase of 5 on the year, and 6 of the appeals

were successful. The breeds of the stallions rejected and the reasons for their rejection are given in the next table.

NUMBER OF APPLICATIONS FOR LICENCES NOT GRANTED AND GROUNDS OF REFUSAL, 1931.

BREED	Number Refused	Percentage Refused	DISEASE							
			Cataract	Roaring	Whistling	Ringbone	Sidebone	Bone Spavin	Shivering	Stringhalt
PEDIGREE—										
Shire	19	2·6	1	5	5	2	3	—	3	—
Suffolk	3	2·2	—	1	1	—	1	—	—	—
Clydesdale ..	2	1·7	—	1	—	—	1†	—	—	—
Percheron ..	2	4·1	—	1	—	—	—	—	—	1
Arab	1	11·1	—	—	—	—	—	1	—	—
Hackney ..	1	4·3	—	—	—	—	—	—	—	1
Thoroughbred ..	5	2·6	1	2	2	—	—	—	—	—
Fell Pony ..	1	9·1	—	—	1	—	—	—	—	—
NON-PEDIGREE—										
Heavy	3	2·8	1	1	—	—	1	—	—	—
Light	*1	5·0	—	—	—	—	—	—	—	—
TOTALS ..	38	—	3	11	9	2	6	1	3	2

* A licence was refused in respect of a stallion that had been "tubed" and could not, therefore, be examined for its "wind."
† Also affected with Ringbone.

The number of infringements of the Act reported during the season was greater than in the preceding season. Successful proceedings were taken by the Police in each of five instances in which unlicensed stallions were being travelled for service. Nineteen stallions, though licensed, were found travelling for service, or exhibited on premises not in the occupation of the owner with a view to their use for service, unaccompanied by the licences, and in these cases the owners and leaders of the stallions were warned as to the requirement of the Act in this respect.

Stallion owners in possession of licences for the year ended October 31, 1931, are reminded that these licences expired on that date, and should have been returned to the Ministry. Applications for licences for the 1932 travelling season may be made as from November 1, and it will greatly assist the Ministry to make economical arrangements for the examination of stallions if applications are made as early as possible after

that date. Application forms may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

NUMBER OF APPLICATIONS FOR LICENCES AND NUMBER OF LICENCES GRANTED AND REFUSED IN ENGLAND AND WALES, 1931.

BREED OR TYPE	PEDIGREE (*i.e.*, Stallions entered or accepted for entry in the recognized Stud Book of their Breed)			NON-PEDIGREE (*i.e.*, Stallions not entered or accepted for entry in a recognized Stud Book)			TOTALS OF EACH BREED AND TYPE (Pedigree and non-Pedigree)		
	Applications	Licensed	Refused	Applications	Licensed	Refused	Applications	Licensed	Refused
HEAVY—									
Shire ..	723	704	19	60	57	3	783	761	22
Clydesdale .	120	118	2	10	10	—	130	128	2
Suffolk ..	134	131	3	3	3	—	137	134	3
Percheron ..	49	47	2	1	1	—	50	48	2
Others ..	—	—	—	32	32	—	32	32	—
LIGHT—									
Hackney ..	23	22	1	4	4	—	27	26	1
Thoroughbred ..	191	186	5	3	2	1	194	188	6
Arab ..	9	8	1	3	3	—	12	11	1
Cleveland Bay ..	5	5	—	—	—	—	5	5	—
Welsh Roadster	1	1	—	3	3	—	4	4	—
Hunter ..	2	2	—	1	1	—	3	3	—
Yorkshire Coach ..	1	1	—	—	—	—	1	1	—
Others ..	—	—	—	6	6	—	6	6	—
PONY AND COB—									
Welsh ..	11	11	—	1	1	—	12	12	—
Fell ..	11	10	1	1	1	—	12	11	1
Dales ..	10	10	—	2	2	—	12	12	—
Polo and Riding ..	9	9	—	1	1	—	10	10	—
Shetland ..	7	7	—	—	—	—	7	7	—
Highland ..	2	2	—	—	—	—	2	2	—
Welsh Cob .	23	23	—	8	8	—	31	31	—
Others ..	—	—	—	—	—	—	—	—	—
TOTALS	1,331	1,297	34	139	135	4	1,470	1,432	38

NOTES ON PRICES AND SUPPLIES*

R. J. THOMPSON, C.B., O.B.E.

THE change in the basis of the currency of this country has naturally caused a disturbance in prices, though the variations —except for some purely temporary fluctuations—have so far proved less than was at first expected. The price of wheat has risen and the prices of other cereals have also hardened. Meat has declined rather than otherwise, but imported dairy produce, bacon and eggs are all somewhat dearer. In some cases, however, the supply position has tended to favour a rise, and it is only to a limited extent that the increase can be attributed to the alteration in the value of money.

The extent to which agricultural prices generally are likely to benefit from the alteration is, indeed, uncertain ; with some products, the advantage is obvious, but the benefit seems likely to vary with different commodities and with the extent to which the bulk of the imported supply is drawn from countries on the gold standard. As is well known by this time, the effect of the abandonment of the gold standard is that the pound sterling is worth less in the currency of countries remaining on the gold standard, so that on the one hand it requires more pounds sterling to pay for imports into this country—assuming that prices in other countries are unaltered —while exports from this country sold abroad and realizing the same amount as before in foreign currency produce more pounds sterling. To take a simple example, $1,000 worth of wheat in the United States on a gold basis would have cost about £206, whereas (taking $3.85 to the £) it would now cost about £260 ; on the other hand, an English exporter selling goods realizing in the United States $1,000 would now be able to convert that amount into £260, whereas on a gold basis it would only have produced £206. Thus the result is to favour exports and to raise the price of imports ; so far as these imports (or exports) consist of agricultural produce, the effect should be to place the British farmer in a somewhat better position in the face of his competitors.

The countries that remain on the gold standard and are of importance as agricultural exporters to Great Britain are the United States, Canada,† France, Holland, Germany, Belgium, Italy, Switzerland and South Africa. With these countries, the exchange is definitely unfavourable, and the price of commodities imported from them will thus

* Written mid-October. † See footnote on opposite page.

tend to rise. On the other hand, some European countries, such as Denmark, Sweden, Norway and Finland, have abandoned the gold standard and the rate of exchange does not show the same marked variation. A third group of countries of great importance as suppliers of agricultural produce, viz., Australia, New Zealand and Argentina, appears to be in much the same position. The currency in Australia and New Zealand is the same as in Great Britain and up to the present there has not been any material alteration in the exchange, £100 sterling being worth approximately £130 in Australia and £110 in New Zealand. In Argentina also, where the exchange has been fluctuating below par for some considerable time, rates are no higher than they were six weeks ago. As regards Russia, which is of special importance as a grain exporter, it is more difficult to speak, but it seems probable that the exchange will adjust itself to sterling.

Thus whilst imports from North America* and from certain Continental countries will cost more and will thus tend to raise prices in this country, the large agricultural imports from Scandinavia, Russia, the River Plate, Australia and New Zealand seem likely to be much less affected by the exchange.

The product which has immediately responded to the new conditions is wheat, of which, in the first nine months of this year, about one-third of our total imports have come from North America. So far as future supplies come from this source, it is evident that this country must pay more and that supplies from Australia, Argentina and Russia will share in the advance. As regards maize, Argentina is the chief source of supply and the price is consequently less likely to be affected. This also applies to beef, mutton and lamb, which come almost entirely from Argentina, Australia and New Zealand. About 70 per cent. of our bacon imports are received from Denmark and Sweden, while as regards butter, nearly 90 per cent. of the imports come from countries whose exchange at present shows no great variation. Canadian cheese should be dearer, while products such as eggs, potatoes and condensed milk from Holland, Germany, Belgium, Switzerland and France will find it more difficult to compete.

In short, while the general effect of the change in the monetary basis is to make imports dearer, this effect is mainly operative in the case of imports from countries on a gold basis, and is much less in evidence with some other countries whence we obtain an important proportion of our agricultural imports.

* Since writing the above, Canada has gone off the gold standard, and the cost of imports from that country should not consequently be raised in the same way as those from the United States.

The prices of imports from these latter countries, even if not very directly affected by exchange factors, is, however, likely to rise to some extent in sympathy with products from countries on a gold basis. Thus the British producer should benefit from the new conditions, though in the case of several products the advantage may not prove of a very appreciable character, and may easily be obscured by movements in price, partly due to normal variations in supply and demand.

The changes that have taken place during the past month in the prices of some of the principal home and imported products can be seen from the following table :—

	Prices early in					
	Oct., 1931		*Sept.*, 1931		*Oct.*, 1930	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
Wheat, Gazette average, per cwt.	5	4	4	9	7	0
No. 2, Manitoba.. ..	6	3	5	2	6	11
Argentine	5	4	4	1	6	10
Russian	5	2	4	5	6	6
Fat cattle, first quality, per cwt.	44	6	45	10	49	3
Beef, English N.M. Prime, per lb.	0	7	0	7½	0	8
Argentine chilled, H.Q., per lb.	0	7½	0	8	0	7⅞
Fat sheep, first quality, per lb. ..	0	10½	0	10¾	1	1½
Mutton, English, per lb. ..	0	9⅜	0	10½	1	0⅛
Lamb, New Zealand, per lb. ..	0	8¾	0	9	0	9½
Bacon pigs, first quality, per score	10	0	10	8	13	10
Bacon, Danish green, per cwt. ..	70	0	70	0	74	0
Pork pigs, first quality, per score	12	4	12	6	17	3
Pork, English, per lb.	0	8¾	0	9	1	0¼
Butter, New Zealand, per cwt. ..	128	0	117	0	122	0
Cheese, New Zealand, ,, ,, ..	72	6	64	6	73	6
,, Canadian, ,, ,, ..	73	0	64	0	81	6
Eggs, N.M. Standard, per 120 ..	20	9	16	0	26	0
,, Danish, 18 lb. per 120 ..	15	0	12	6	17	0
Potatoes, King Edward, Lincs. and Yorks, per ton	160	0	150	0	130	0
Wool, Southdown, per lb. at Bradford	1	0½	1	0	1	2
Maize, Argentine, per cwt. ..	4	2	3	9	5	9

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending October 14, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

Wheat.—The increased cost of buying wheat in the United States and Canada has caused the prices of all grades to rise sharply. English wheat of fair average quality in the middle of October was realizing about 25*s.* per 504 lb. as compared with 20*s.* a month earlier, and it will be seen from the table above that imported sorts show an increase of 9*d.* to 1*s.* 3*d.* per cwt., or from 3*s.* 4*d.* to 5*s.* 7*d.* per 504 lb. Prices of imports have been subject to much fluctuation, but during the second week of October a firmer tendency developed consequent on

smaller offers from Russia and higher prices in Argentina. The Liverpool December future, which was quoted on September 15 at 3*s.* 11⅞*d.* per 100 lb., stood a month later at 4*s.* 9*d.*

Over one-half of the world's requirements of wheat during the remainder of the present cereal year will have to be drawn from the United States and Canada, so that the market is likely to be very sensitive to increases or decreases from other sources. Russia remains an uncertain factor. The new crops in Argentina and Australia are generally well spoken of, though likely to be smaller than those of 1930-31. The Continental demand remains poor, though the shipments to Europe (including the U.K.) are nearly on the same level as last year; the ex-European shipments have been decidedly larger, so that the total to all destinations since the beginning of August to October 10 has amounted (according to the *Corn Trade News*) to 20,220,000 qr. against 19,294,00 qr. in the same period last year. To this total, Russia and the Danubian countries have been exceptionally large contributors, 7,791,000 qr. being shipped from Black Sea ports as compared with 4,237,000 qr. last year. On the other hand, it is noticeable that Canada and the United States have so far been shipping much less freely, and the American visible supply shows very little reduction on last year. Owing to the light spring crops the quantities coming forward in America are relatively small, and it is quite possible that farmers may be holding back in the hope of better prices later on. Domestic prices in the United States show little change as compared with a month ago.

Imports into the U.K. during August and September were large, amounting to 3,791,000 qr. as against 2,594,000 qr. in the same months last year. Port stocks show a heavy increase as compared with a month ago, and are now nearly 2½ times as much as they were at the same time last year.

Cattle.—Early in October there was some slight resistance to the downward tendency that was so marked in the price of fat cattle in the two preceding months; first quality, however, only averaged 44*s.* 6*d.* per live cwt., as compared with an average of 45*s.* 6*d.* during four weeks in September and 51*s.* 1*d.* in June. Rates were nearly 5*s.* per live cwt. less than in October last year, but on the whole fat cattle have stood up to the general decline in live stock prices relatively better than sheep and pigs. Supplies both from home sources and from Ireland have been on about the same level as last year, and imports of chilled beef have also been kept within moderate limits, so that the beef trade has not been exposed to any

exceptional competition from abroad as regards quantities offered for sale. Prices of cattle in Argentina are, however, very low, the rates paid by freezing companies having shown a progressive reduction since the beginning of 1930, and in the middle of this year the drop was 25 per cent. or more. This reduction seems to have been caused by a falling-off in the demand for frozen beef and canned meat which has not been counterbalanced by any increase in chilled beef. The total number of cattle of all grades slaughtered at the freezing houses in Argentina and Uruguay, January-July, 1931, was only 2,527,000 as compared with 2,920,000 in the same period of 1930. On the other hand, supplies are plentiful, and a recent trade circular states that everything points to an abundance of fat cattle in the near future. The drop in Argentine prices has been reflected in lower rates for chilled beef in England, the average wholesale price over the first nine months of this year being 17 per cent. below the corresponding period last year. The recent change in the value of the pound has not apparently so far affected the situation.

Sheep, Mutton and Lamb.—Prices of fat sheep (first-quality Downs and Crossbreds) showed a further decline in September, though they were slightly firmer early in October. English mutton showed the same general tendency, and at the end of the month first quality fell as low as 9½*d.* per lb. on the London market. A peculiarity of these low prices has been that while English mutton in August and September was tending downwards, frozen lamb—which is the nearest to it in quality—was rising, and for several weeks approached it very closely in price, the difference being only 1*d.* per lb. or less, whereas English mutton during most of the year enjoys a premium of 2½*d.* to 3*d.* per lb. This similarity in price has occurred in the autumn in some previous years ; indeed, in each October from 1926 to 1928 the prices of English mutton and New Zealand lamb were very nearly the same. This appears to be due to the fact that supplies of frozen lamb are then lower than at other times of the year, while supplies of home-grown mutton and lamb, including live animals imported from Ireland, are large. There is also probably some relative decrease in the quality of English mutton which makes it more susceptible to the competition of frozen meat.

Store sheep have shown a marked drop this season in conformity with the decline in fat sheep prices, the average value in September being 23 per cent. below the rates realized last year.

Pigs, Pork and Bacon.—The pig situation shows little appreciable change. The number of fat pigs shown at markets continues to be large ; during the past three months it has been 15 per cent. above last year's figures. Good numbers have also been received from Ireland. Pork still remains very low. Imports of bacon showed little variation from the high figures that have been recorded for some time past, receipts in September amounting to 946,000 cwt. as compared with 788,000 cwt. in September, 1930. It remains to be seen whether the alteration in the exchange will have any effect ; prices of some grades of bacon have been somewhat firmer, but the change is no greater than has been common lately in the ordinary fluctuations from week to week, and rates generally early in October were below those ruling in August.

Butter and Cheese.—Imports of butter in September were again lower than for several months past, and stocks in store were drawn on to meet the consumptive demand. This is normal for the time of year, but the stocks are now somewhat lower than at the corresponding date last year. Production in Australia continued to show a seasonal expansion, but weather conditions in New Zealand are reported to be unfavourable, and it is stated that the output will probably fail to reach last year's figures. Prices have become firmer, New Zealand salted first quality having risen from 117*s.* in September to 128*s.* in October, and Danish from 128*s.* to 136*s.* per cwt.

Imports of New Zealand cheese in September only amounted to 60,000 cwt. against 107,000 cwt. in September, 1930, while receipts from Canada this season have also been somewhat lower than in the past two years. Cheese gradings in New Zealand in September were 37 per cent. less than in the same month of 1930, while gradings in Canada during the past three months have shown a reduction of 10 per cent. Prices have become firmer both as a result of the moderate supplies and as a consequence of the alteration in the exchange, Canadian rising from 64*s.* in September to 73*s.* in the middle of October, and New Zealand from 64*s.* 6*d.* to 72*s.* 6d. A rise in the price of manufacturing milk may therefore be expected.

Eggs.—As a consequence of the increase in the number of fowls shown in the June returns, the output of eggs in the twelve months 1931-32 will be larger than last year by about 11 per cent. or roughly 200 millions. There seems to be an ample consumptive demand for the extra supplies that are

being produced, as imports show little real change. It is true that in the first nine months of this year the receipts have been about 3 per cent. less than in the same period of 1930, but as the numbers last year were the largest recorded, the variation is unimportant. The decrease has been mainly due to a heavy drop in imports from Poland, France and China, while Denmark and Holland have augmented their exports. Prices, while showing the normal seasonal rise, have been about 3*s.* per 120 lower than in 1930, this lower level being, no doubt, attributable to the larger home supplies and to the increased receipts from countries that provide eggs most nearly approaching them in quality.

Eggs are now being received from South Africa and Australia, the season of imports from both countries extending from September to January, the main receipts reaching this country in November and December. Last season the arrivals from South Africa were approximately 574,000 great hundreds, and from Australia practically the same quantity. It is expected that the shipments from both Dominions will exceed last year's totals.

Feeding Stuffs.—*Maize.*—Low prices have led to a very active demand for maize, and shipments both to this country and to the Continent have been exceptionally heavy during the past six months. Supplies are still ample, but it seems unlikely that exports can continue to be made on the same scale during the remainder of the season up to March next, and prices should consequently become firmer.

The total shipments from all sources this season (April 1 to October 12) have amounted to about $28\frac{3}{4}$ million qr. as compared with 19 million qr. in the same period last year, and of these $26\frac{1}{2}$ million qr. have been provided by Argentina. The balance remaining in that country for export was officially estimated at $11\frac{1}{2}$ million qr., but commercial estimates assume a rather higher figure. The remainder of the supply needed to meet European requirements has to be obtained mainly from Roumania and other South Eastern countries and from South Africa and Rhodesia. The United States is a large producing country, but for some years exports have been relatively unimportant, and this year, though the crop is large, domestic prices are above competitive Argentine rates, so that there is no inducement to export at present. As regards Roumania an abundant crop is forecast, about 30 per cent. higher than last year, but only moderate shipments are usually

made in the autumn and winter. In 1929, when crop yields were comparable with those of this year, the total shipments from the Black Sea and Danubian Ports in the six months October-March were only about 2,150,000 qr. For South Africa the export surplus from the current crop has been fixed at 1,500,000 qr. which is less that the amount available last year. On the whole, the quantity of maize coming forward from all sources during the remainder of the current season up to the time when the new Argentine crop begins to be put on the market is likely, as suggested above, to be proportionately less than the quantity actually shipped in the first part of the season. Prices in Argentina showed a tendency to rise early in the month, and on October 14, the December future stood at 4.37 against 3.78 (pesos per quintal) a week earlier, the difference being roughly equivalent to 1*s.* 3*d.* per quarter.

In connexion with the supply from South Africa, it may be of interest to note that legislation that has recently come into force in that Dominion provides that a percentage of the maize crop (to be fixed annually) shall be exported, the object being to raise the price of the balance remaining for internal consumption. Under this arrangement, it is contemplated that, say, one-third of the crop would be sold for export, at such price as was obtainable, while the remaining two-thirds, being the quantity estimated as necessary for home needs, would fetch much higher prices, with the result that the average price obtained for the crop as a whole would be raised. Legislation is also in force in Southern Rhodesia designed to maintain the price received by producers above the world level, but the method adopted is different. The maize crop is vested in a Control Board* which sells for internal consumption at fixed prices and exports such quantities as are regarded as surplus. Advances are made to growers, with a final settlement at the end of the season based on the average result of the operation.

The total quantity of maize imported into the U.K. in the past cereal year (September, 1930-August, 1931) was 10,487,000 qr. as against 7,693,000 qr. in the preceding season, and receipts continue to be large, 1,035,000 qr. being landed in September, 1931.

Barley.—Complete figures of the world barley crop are not yet available, but preliminary estimates suggest a reduction of from 15 to perhaps 20 per cent. as compared with last year. In the United States, which is a leading exporter to the U.K.,

* See also p. 836.

the crop is only 216,000,000 bushels against 326,000,000 bushels in 1930, while in Canada the reduction is still greater, viz., 72,500,000 bushels as compared with 135 million bushels last year. No information as to production is available from Russia, but weather conditions seem to have been unfavourable. In Roumania, the crop is estimated at 30 per cent. less than in 1930. On the whole, prospects for feeding barley are less favourable than in the autumn of last year, and somewhat higher prices would seem to be indicated.

Oats.—As regards oats, the supplies reaching Great Britain come chiefly from Argentina, Canada, Russia, Roumania and Chili. Prospects in these countries are at present somewhat uncertain. Canada has a much reduced crop, though stocks in hand are large. In Argentina, a smaller acreage has been sown, but the probable out-turn is not yet known. The balance of supplies remaining to be shipped from the last crop is small. In Roumania, the estimated production is some 25 per cent. less than in 1930, but shipments from Russia and the Danubian countries this season have so far been large, some 720,000 qr. having been loaded up to October 10, against 137,000 qr. last year. Generally, the supplies on offer are limited and the market is consequently firmer.

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NOVEMBER ON THE FARM

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THIS month has the reputation of being the foggiest in the whole year. Dark, unsettled and stormy weather may be generally expected. "When dull November's surly blast made fields and forests bare," writes Burns, and Howitt remarks, "We are now in a month of darkness, storms and mist—of the whirling away of the withered leaves and the introduction to complete winter."

Arable Land.—Work on the arable land is now very much dependent on weather and soil conditions. Under favourable conditions wheat sowing is continued. In the south a very good practice for late sowing is to sow immediately behind the plough, and where press drills are used good results usually follow. A little more seed is now required and a variety like Little Joss is more favoured for late sowing than Red Standard, Victor or Yeoman. A firm seed-bed is important and the land should not be of a heavy nature or waterlogged.

On heavy wet land late sowing should not be practised.

With the conclusion of autumn sowing, the next year's root and fallow ground may be ploughed. Land that is destined for sugar beet should receive the farmyard manure now and be ploughed without undue loss of time.

The actual preparations for sugar beet vary according to particular circumstances. Deep and thorough cultivation is important and has a material influence on the quantity and quality of the crop. Some years ago subsoiling was very generally advocated and widely practised, but the results were not always satisfactory and the practice has declined. It is impossible to lay down any hard and fast rules for soil cultivation, but a few observations on the methods adopted by successful farmers may be helpful.

The corn stubble can be cultivated as soon as possible after harvest, and any permanent weeds like couch should be collected and burnt. Many seeds of annuals will be encouraged to germinate and are destroyed later.

Ploughing may be done once before the farmyard manure is applied, but carting is easier on a cultivated surface than on ploughed land, and if the manure is available and sufficiently rotted it can be applied before the first ploughing. This first ploughing should not be too deep, and should be done as soon as possible after the manure is applied; it should be followed at a convenient time, but before the end of December, by a deep ploughing, the depth varying with the character of the land. Where the character of the soil will allow, a depth of 10 in. represents sound practice, but there is a limit to the amount of new soil that can be turned up without causing injury. A subsequent cross-ploughing in March is usual on medium and light soils, but on heavy soils the spring ploughing is not advisable as there is a very real danger that a suitable tilth may not be obtained by cultivations comparable with the tilth obtained by the weathering during winter. On light soils the spring ploughing is necessary and materially reduces the number of annual weeds that are likely to appear during the early growth of the beet crop.

Hedges and Ditches.—Perhaps no feature in the country better illustrates the difficulty of the arable farmer to find money to pay for necessary labour than the state of the hedges and ditches. Unless ditches are kept in order the land must deteriorate and land drains become not only ineffective but may become blocked and burst, and prove actually injurious. The laying down of land to pasture does not mean

that hedging and ditching can be dispensed with, and silted and overgrown ditches or wide-spreading hedges can never be profitable. Now is the time to do work of this kind.

Pastures.—Grass is the main food of cattle and an increasing number of sheep. The area under grass is steadily increasing, but so also is the area classed as rough grazings. During the last few years, the potential value of grass land has been greatly increased. The more general use of wild white clover and better strains of pasture plants have brought about improvements both in the quality and quantity of grass and the stock-carrying capacity of the land. Cultivation and manuring of grass land have received much attention, and no expenditure on the farm is more remunerative. If the methods now being practised by the most progressive farmers were adopted universally the stock of the country could be materially increased and their cost of production decreased. Pastures require cultivation. Poor quality pastures carrying a small head of live stock are in greater need of mechanical treatment than rich pastures where the heavy stocking possible is in itself often all that is necessary. Poor pastures which are drifting towards the rough grazing class should be reclaimed by the cultivator and harrow, and the work can be proceeded with at any time between November and the end of March, and need not involve any extra expenditure where horses and men are not otherwise profitably engaged during the winter months. The worse the condition of the pasture the more likely is the work of cultivation to be profitable, and when a proper surface has been prepared manures have a chance to produce further benefits.

Live Stock.—Live stock and live-stock products account for the major portion of the total agricultural revenue. Great strides have been made in the improvement and management of stock as instanced by earlier maturity in meat production, higher milk yields and greater egg yields. High production, however, is only one side, and the pressing need is more economic production. There would appear to be no reason why the two should not go together, and most people will agree that up to a point they do so. Early maturity and high production are in part individual characters dependent on strain and breed, but also on environment and nutrition. No one would argue that sheep would mature so quickly on the higher lands on the older geological formations as on the

lower richer land, unless it were by undue expense in artificial feeding. Contrasts exist in cattle and in milk production on similar lines, and the problem is to secure the best economic result using the natural resources and artificial aids in combination. In all conditions, however, there are limiting factors.

We, in Britain, are favoured with a healthy climate ; our live stock are in the main healthy, but there are ailments and diseases that cause annoyance and loss. Poultry, pigs and sheep all have their troubles, which when severe cause serious loss to their owners. Milk could be produced cheaper if the cows were to retain their health and breeding powers to old age.

It is generally agreed that a dairy cow is not at her maximum production until after her fourth or fifth calf. Too many never reach this stage ; very few are finally discarded because of old age.

Several investigations have been made and some are still proceeding as to the reasons why cows are sold from the dairy herd. The matter is complicated by the sale of cows from one dairy herd to another, and the previous history is not always known. Since 1917 the average renewals each year in the whole of the milk-recorded herds has varied between 30 per cent. and 40 per cent. Generally speaking about one-third of the cows in the herd are replaced each year. The extent of the renewals is no criterion of the economic aspect of milk production. Replacements effected because of the sale of cows in their prime, or because of old age, or because the cows can easily be replaced by better and more profitable animals, may be the source of direct financial gain.

In an investigation carried out by the writer extending into six counties and over 200 herds, the number of cows disposed of for no fault was under 15 per cent. of the total ; low yields accounted for 21 per cent. and old age for only a little over 3 per cent., leaving 61 per cent. to be accounted for by failure to breed or by diseases such as abortion, Johne's disease, udder troubles, tuberculosis and accidental causes. The most prevalent cause of disposal is sterility, much of it due to the prevalence of contagious abortion, and the animals so affected are comparatively young.

The average age at which animals are disposed of is of interest, and the writer has attempted to get some information on this point. From 39 herds reliable information was obtained as to the number of calves bred before the animals were sold. The average in one year was 3·18, but this included a number

of cows that were sold for no fault and would continue their career in another herd. The number of such cows was only 12½ per cent. of the total disposals and their average calvings were already 3·43. The cows with the fewest calvings and disposed of at a comparative early age were those sold because of low yields, sterility and Johne's disease; the average calvings in these cases were under 3.

Many and varied opinions are held regarding the causes of the troubles associated with milk production, but since individual experience varies from year to year, real knowledge on the subject must await the carrying out of carefully devised and conducted investigations. At present the only point that is fairly clear is that herds wholly maintained by home-bred stock suffer much less wastage than herds either wholly purchased or partly bred and partly purchased. The latter mixed type of herd maintenance is very common, and there is some evidence to indicate that abortion and sterility are more prevalent where this method is adopted than in either of the other methods mentioned.

Wherever possible the aim should be a self-supporting herd, or where heifers are purchased the safest course in order to avoid trouble with abortion is to buy them young before mating.

* * * * * *

NOTES ON MANURES

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Notes from Rothamsted and Woburn.—During the past season, many visitors have inspected the plots at Rothamsted and Woburn, and a few notes on the demonstrations that have aroused most comment among farmers may be recorded. The soils are of quite distinct character ; at Rothamsted there is a clay loam, well supplied with chalk, resting on a clay subsoil, and at Woburn a light sandy soil, with no reserve of chalk, resting on sand. Nevertheless, on both farms, as far as could be judged by the eye, it was the response to nitrogen that was most striking. This result is probably true of the majority of arable farms in this country except, perhaps, where dung is unusually plentiful or long leys, full of white clover, form the basis of fertility. It should be recognized, however, that, in certain instances, the noticeable effect of nitrogenous manures on leaf development may not result in a proportional gain of roots, tubers, or grain. Sugar beet frequently produces less root than the vigorous growth of tops might lead one to expect ; and the same thing has been observed in early potatoes.

The continuous wheat on Broadbalk (Rothamsted) looked unusually well till torrential rains came towards the end of July and lodged the plots receiving dung or the heavier nitrogenous dressings. A striking result was the behaviour of plot 10, which has received approximately 4 cwt. of sulphate of ammonia each year since 1843. This plot stood up well and, judged from any standpoint, was an unusually strong piece of wheat. In recent years, this plot has done very well and has occasionally outyielded plot 7, which receives phosphates and potash in addition to the same quantity of nitrogen.

Putting the yields on the completely manured plot as 100, the corresponding figures for the plot receiving sulphate of ammonia only have been

Average 1852-1925	62
Average 1918-27 (the last ten years before fallowing operations)	58
1928-30 (immediately after fallowing)	90
1929-30 (after one or more crops of wheat)	101

On Hoos field, phosphate was as clearly marked in its effects on barley as nitrogen usually is on the Broadbalk wheat, and the poorness and lateness of the no-phosphate plots was always commented on by farmers. Sulphate of ammonia alone on barley was not nearly so successful as on wheat.

The complete omission of potash resulted in a very nice-looking crop of barley, quite up to the standard of the best plots in appearance except that it showed an unusually large amount of the well-known leaf-stripe disease. On the grass plots in the Park, there was an unusual amount of growth on the unlimed areas, which had been heavily treated with sulphate of ammonia for many years and were consequently very acid. The quantity of grass produced on these acid plots may be considerable in wet seasons, such as the present, whereas in years of spring drought the plots are almost bare. In any case, the herbage (Yorkshire fog with small amount of vernal grass, bent, and fine fescue) is almost worthless, but its bulk is clearly governed by the rainfall.

As to the continuous mangold field, perhaps the demonstration that raises most comment is the effect of an addition of nitrogenous artificials to farmyard manure. Plots receiving an annual dressing of 14 tons of dung give only average crops (about 18 tons per acre), not the yields that might be expected from such quantities of manure. The addition of a top dressing of nitrate of soda greatly benefits the crop, the usual increase being of the order of 50 per cent. in roots and rather more in tops, showing that, although there may be very lasting residues from the organic manuring, the quantity of nitrogen available to the crop in any one year is not excessive.

At Woburn, the classical fields have been left without further manure since 1926, the close of the 50-year period. They were fallowed in 1927 and 1928 and have since been cropped. As might be expected on such land, the residual effect of the manures, although revealed in 1929 in the case of dung and the more successful artificial treatments, was not very obvious in the field this year. An unexpected effect was what appeared to be the partial recovery of one of the wheat plots made acid by the continued use of sulphate of ammonia, and which had, consequently, for many years, yielded less that a parallel plot that had received a dressing of lime. The ratio of yields in previous years had been :—

	1907-16	1917-26	1929
Limed in 1906	100	100	100
Never limed	73	67	82

In the season just ended, the plot without lime looked leafier and of better colour than its limed counterpart, an unusual result that is as yet unexplained. Appearances of this kind are sometimes deceptive and the actual weights are not yet available.

The effect of direct additions of nitrate of soda to part of the wheat following mustard or tares ploughed in as green manures was most striking, showing clearly that the nitrogen supplied by a long course of green manuring was insufficient for the needs of the plant. On a light, open soil, such as the one in question, any accumulation of nitrate is readily washed out and the crop is left dependent on artificial additions made at the time of active growth.

Nitrogen on Grass.—Much has been written in recent years on the use of nitrogenous manures on grass land. As far as hay production is concerned, nitrogenous manures have long been employed to increase the bulk of the herbage, although a great deal of this nitrogen in ordinary practice comes, no doubt, rather from dung and cake feeding than as direct additions of quick-acting artificials. Nevertheless, on many farms run at a fairly high level, it is quite usual to top-dress the meadows in early spring with sulphate of ammonia, nitrate of soda or some other source of nitrogen, in order to increase hay production.

The gain in bulk of hay, following the use of nitrogenous fertilizers, is easily ascertained by direct experiment, but on this point there is much less evidence than where phosphatic fertilizers are concerned. In fact, the performance of nitrogen as a hay producer over a wide range of conditions has seldom been summarized in this country. Estimates of the extra yield of hay commonly obtained per 1 cwt. of nitrogenous fertilizer—say, 23 lb. nitrogen—range from 4 to 6 cwt. per acre.

It is of interest, therefore, to have on record the performance of nitrogenous fertilizers in increasing the hay crop, taken from a large number of German experiments reported by Dr. O. Nolte.* He gives the results obtained by the use of nitrogenous manures on a wide range of German soils. For convenience, the corresponding increases in cwt. per acre per 23 lb. nitrogen, equivalent to 1 cwt. per acre of sulphate of ammonia, are here calculated. The figures are :—

Soil type	*Kilogrammes hay per 1 kilo nitrogen*	*No. of expts.* 1923-30	*Calculated increase cwt. hay per 23 lb. N. per acre*
Sand and loamy sand ..	29.5	29	6.1
Sandy loam	30.7	23	6.3
Loam	32.6	44	6.7
Clay and heavier soils ..	28.4	22	5.8
Humus sands	36.8	59	7.5
Average of mineral soils ..	32.6	177	6.7
Lowland peat (fenland type)	19.5	12	4.0
Highland peat (acid peat) ..	22.5	4	4.6

**Fortschritte der Landwirtschaft*, 1931, Vol. 6, p. 513.

It will be seen that the average performance of nitrogenous fertilizers under German conditions corresponds to an increase of about 6½ cwt. hay per 1 cwt. of sulphate of ammonia equivalent. This agrees fairly well with the English estimates and, with ordinary prices of hay, represents a remunerative increase, especially in view of the abnormally low price now prevailing for nitrogenous manures—about 6*s*. 6*d*. per unit at the time of writing.

In addition to the yield, the question of quality has to be taken into account. A certain amount of suppression of the leguminous species is likely to occur; but if the hay is cut in good time this is partly offset by the leafy character of the herbage, which, in its younger stages, is very rich in digestible protein. In any case, reliance should not be placed on nitrogenous manures alone, but when the quality has been obtained by other means nitrogen can be used to increase the bulk. The basis of the manuring of grass land for hay production should be phosphate, with potash and lime as valuable supplements on most soils. These manures encourage the leguminous part of the herbage—a point of special importance in meadows, since mowing tends to suppress the clover more than the taller grasses.

The practice of applying nitrogen to grazing land, either to induce an early start in spring or to force production throughout the growing season, is now gaining ground in this country. The measurement of the result of this practice is not such a simple matter, since the extra produce is realized in the form of an increase in milk-flow, live-weight, or head of stock maintained per acre. These items are more variable in themselves, and their magnitude also depends on the personal judgment of the stockman, since he controls the grazing of the animals. The effect of nitrogen on pasture land has been gauged in terms of milk and stock-carrying capacity, but, in many cases, the performance of similar land without nitrogen has not been very definitely determined. A very extensive series of experiments, comparing the traditional mineral treatment with the same treatment plus nitrogen, has recently been carried through in New Zealand.* The basis was a very broad one and many points were covered, but, as regards the general effect of nitrogen on the productivity of dairy pastures, the results under the conditions prevailing averaged out as follows :—

*A. W. Hudson and J. W. Woodcock, *N.Z. Jour. Agric.* 1931, Vol. 42, pp. 99-115.

Increase over phosphate and potash per 1 *cwt. sulphate of ammonia.*

1929. Average of 74 trials, 13.5 lb. butter fat.
1930. „ 84 „ 18.5 lb. „ „

These amounts of butter fat correspond approximately to 34 and 46 gallons of milk respectively.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended October 7				
	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) .. *	..	..	..	..	..
„ „ Granulated (N. 16%) *	..	..	..	..	..
Nitro-chalk (N. 15½%) .. *	7 5*d*	7 5*d*	7 5*d*	7 5*d*	9 4
Sulphate of ammonia :— *					
Neutral (N. 20·6%) .. .. *	6 5*d*	6 5*d*	6 5*d*	6 5*d*	6 1
Calcium cyanamide (N. 20·6%) *	6 5*e*	6 5*e*	6 5*e*	6 5*e*	6 1
Kainit (Pot. 14%) .. .. §	2 17*h*	2 14	2 13	2 18*g*	4 2
Potash salts (Pot. 30%) .. §	4 12*h*	4 9	4 9	4 11*g*	3 0
„ (Pot. 20%) .. §	3 6*h*	3 3	3 2	3 7*g*	3 4
Muriate of potash (Pot. 50%) .. §	8 15*h*	8 10	8 7	8 14*g*	3 6
Sulphate „ (Pot. 48%) .. §	10 13*h*	10 7	10 7	10 12*g*	4 5
Basic slag (P.A. 15½%)‖ .. §	2 10*c*	2 0*c*	..	2 6*c*	2 11
„ (P.A. 14%)‖ .. §	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
„ (P.A. 11%)‖ .. §	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖ .. .. .. §	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A.16%) §	3 11	..	3 9	2 15*k*	3 5
„ (S.P.A.13½%) §	3 5	2 9	3 3	2 10*k*	3 8
Bone meal (N.3¾%, P.A.20½%) §	8 15	..	7 0	6 10	..
Steamed bone flour (N. ¾%, P.A. 27½-29¼%) .. .. §	5 19*b*	..	6 0	5 5	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on Northern rails; Southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra and for lots of 2 tons and under 4 tons 5*s.* per ton extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

g Prices shown are f.o.r. northern rails; southern rails 2*s.* 6*d.* extra.

h Prices are ex ship; for delivery from store, Kainit and potash salts are 6*s.*, and muriate and sulphate, 10*s.* per ton extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

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NOTES ON FEEDING

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The Nutritive Value of Hay.—Hay has long formed the basis of the winter feeding of English live stock. Since the War the grassland area has increased and the supply of hay has become larger in relation to that of other home-grown foods. The hay season of 1930 was in most districts favourable, with the consequence that there were considerable stocks of hay left on hand at the end of last winter. The hay crop of 1931 has been abundant, and although the weather as a whole was bad for the hay harvest, a proportion of the hay got early in the season is of good quality. Much of the hay saved later, however, was in some degree spoilt by rain. The resulting position is that most farmers find themselves with a plentiful supply, some of the hay being of first-class quality, while the remainder varies from moderate to poor. The current market price is low, and in general it should be found the better proposition to use hay as far as possible at home in preference to selling, unless a specially good market can be obtained.

The composition and, therefore, the feeding value of hay varies within fairly wide limits. The most important factors that influence its nutritive value are the stage of maturity or ripeness when cut, the proportions of grasses to clovers, the leafiness of the herbage at the time of cutting and the amount of leaf that can be retained in the process of hay-making, the land on which grown and its manurial treatment, and the weather conditions at the time of hay-making.

As is generally known, the principal constituents of any food-stuff are the protein or albuminoids, fats or oils, carbohydrates, fibre, mineral matter and vitamins. Hay is characterised by its richness in carbohydrates, its relatively lower percentage of protein except when it is of absolutely first-class quality, and its high percentage of fibre. The amount and composition of the mineral matter varies considerably, and the variation may be such as to have an important bearing on the feeding value of any particular lot of hay. Generally, a high percentage of fibre depresses the nutritive value of any food, and hence factors that tend to reduce the amount of fibre are worth consideration, as well as those that raise the percentage of protein above the general level.

The average composition of various classes of hay in terms of starch equivalent and protein equivalent is as quoted below.* The conventional method of giving the composition in terms of starch equivalent and protein equivalent is convenient for comparing feeding values, but is incomplete because it provides no information as regards the mineral content.

Hay	*Dry matter*	*Per lb. Starch equivalent*	*Protein equivalent*
Clover	·835	·32	·07
Lucerne	·835	·24	·079
Meadow, poor	·857	·19	·029
„ medium	·857	·31	·046
„ very good	·840	·40	·078
Mixed seeds	·86	·24	·049

Experiments, notably those conducted by Fagan† at Aberystwyth, have shown that as grass advances in maturity there is a fall in the proportion of protein and mineral matter, accompanied by an increase of fibre; hence the importance of cutting hay early, say within a few days of its maximum flowering and before the formation of seed has begun. Experiments carried out at the Agricultural School, Naesgaards, Denmark, with clover hay, showed that 200 lb. of early-cut hay was effective in producing 16·28 lb. more milk than an equal quantity of hay cut later from the same field. The earlier-cut hay was also found to be the more digestible and nutritious for calves.

The higher the proportion of clover to grasses in the herbage, the higher will be the content of protein and minerals, notably lime, in the hay. The amount of fibre is high in the stem of forage plants, while the leaf is richer in protein and minerals; therefore, the more of the leaf that can be preserved in haymaking, the higher will be the feeding quality of the hay.

An application of basic slag has been shown to increase the protein, lime and phosphates. Potash, however, does not appear to exercise a very widespread improvement. The general benefit of potash manures seems to be confined to soils definitely deficient in potash. The effect of an application of nitrogenous manure is, in the first instance, to produce some increase in protein and decrease of fibre. Considerable care has still to be exercised, however, relative to the ultimate effect that repeated dressings of nitrogen may have on quality.

* Ministry of Agriculture and Fisheries, *Report on Rationing of Dairy Cows*, 1925.

† *Welsh Journal of Agriculture*, Vol. IV.

Hay harvested under wet and unfavourable climatic conditions is altogether poorer in feeding value than well-got hay, owing to the washing out of soluble ingredients. Such hay contains more indigestible fibre. Well-got hay is both more nutritious and more palatable than hay that has been much "weathered."

For the winter feeding of dairy cows it can be shown by calculation that first-class meadow-hay is practically sufficient for maintenance, and for the production of 3 gallons of milk :—

	Starch equivalent lb.	*Protein equivalent* lb.
Requirement for maintenance..	6·9	·74
„ „ production of 3 gal., say, 2·2 lb. starch equivalent and 0·5 lb. protein equivalent × 3 = ...	6·6	1·5
	13·5	2·24
30 lb. very good meadow hay supplies ..	12·00	2·34

In this particular case there is no shortage of protein, but if hay falling below first-class standard were used there is likely to be some protein deficiency. This would require to be made good by providing an appropriate quantity of a suitable concentrated food.

That cows giving 3 gal. of milk daily can be successfully fed on first-class hay without the addition of concentrates is borne out by observation of results in practice, while it is not uncommon for a 2-gal. average to be maintained throughout the winter with hay alone or with hay fed in conjunction with roots. In these days of low milk prices, shortage of ready money, and abundant supplies of hay and roots, farmers will no doubt seek to effect economies in expenditure, and endeavour to balance their budgets by reducing their purchases of concentrated foods. It may be to their advantage to do so, even if such a modification of their usual practice should result in a somewhat lower output of milk per cow. It is recognized that the heavier-yielding cows will require and will repay adequate feeding with concentrated food, but on the other hand there has unquestionably been some tendency in recent years to over-feed the lower-yielding cows with concentrates. The latter practice requires to be carefully reviewed and adjusted in the light of existing financial conditions.

Trials with sheep and store cattle have shown that hay, even when not of first-class quality, is sufficient for main-

tenance, when fed to those classes of stock under usual wintering conditions, that is to say when the stock have access to winter grazing or are provided with roots or green fodder crops.

As prices for fat lambs or tegs are at a low level, and since there may be some prospect of a rise as the season advances, farmers who have the necessary facilities on arable land may find that it will pay them to keep on tegs, which are now nearly fat, by folding them on roots or green crops and feeding hay with a little or no concentrated food.

The abundance of fresh grass meanwhile on the pastures will tempt graziers with lambs in forward condition to run them on grass in the hope that prices may improve. If the lambs can be induced to eat a daily allowance of hay it will help materially to maintain and improve their condition.

As regards the use of hay in the fattening of cattle it is significant to find that one of the foremost of cattle feeders in the N.E. of Scotland in the later decades of the last and the first decade of the present century was a profound believer in the value and efficacy of hay, both in the preparation of show cattle and those disposed of as commercial stock for the highest grade of meat trade. It is recorded by Barclay* that, contrary to the usual practice of that part of the country, Mr. Robert Turner, Cairnton, Banffshire, fed practically the whole of his hay crop to his cattle. The majority of farmers in the area relied for fodder almost wholly upon their good quality oat straw.

The writer recalls the high standard of weight for age and degree of finish which Mr. Turner secured in his cattle, and, knowing something of his methods, concludes that his practice of feeding hay in preference to oat straw to his fattening stock was arrived at after careful trial and shrewd observation of results. Mr. Turner's opinion was that when the current price of good mixed seeds and clover hay was 6*d.* to 7*d.* per stone (22 lb.), or £2 10*s.* 11*d.* to £2 19*s.* 5*d.* per ton, it was one of the cheapest available foods for cattle. It was his custom to give to his fattening cattle as much good hay, fed long, as they would readily clear up, after their allowances of concentrates and roots. That portion of the concentrates which was in the form of meal was mixed with cut or chaffed hay.

About 20 lb. of first-class meadow, clover or lucerne hay will supply practically all the protein that a fattening beast

* *Trans. Highland and Agric. Soc.*, 1908.

requires. With the addition of a correctly adjusted quantity of roots to help satisfy the appetite, and home-grown cereals or other starchy foods supplied to secure the desired rate of daily live-weight increase, it is possible to obtain entirely satisfactory results without the further addition of a protein-rich cake. It is true again, however, that where the hay is not up to the description given above, then some food to supply the necessary protein should be added.

Finally, it should be recognized that first-class hay is a precious and valuable food, and it will pay the feeder to ensure that it is treated as such, and that quantities are carefully checked and effectively controlled.

* * * * * *

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 8
Maize	81	6·8	4 3
Decorticated ground nut cake	73	41·0	8 10
,, cotton cake	71	34·0	7 0

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·21 shillings, and per unit protein equivalent, 2·07 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

In accordance with the recommendation of this Committee the " food values " given in the following table may be taken as applicable to the ensuing four months, December to March, inclusive, for the purposes of advisory schemes on the rationing of dairy cows.

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
Roots—	Per cent.	Per cent.	£ s.
Kohl Rabi	8	0·5	0 11
Mangolds	7	0·4	0 9
Potatoes	18	0·6	1 3
Swedes	7	0·7	0 10
Turnips	4	0·4	0 6
Green foods—			
Cabbage, drumhead	7	0·9	0 10
,, open-leaved ..	9	1·5	0 14
Kale, marrow stem	9	1·3	0 13
Silage, vetch and oats ..	13	1·6	0 19
Hay—			
Clover hay	38	7·0	3 0
Lucerne hay	29	7·9	2 11
Meadow hay, poor	22	2·9	1 12
,, ,, good	37	4·6	2 14
,, ,, very good ..	48	7·8	3 14
Seeds hay	29	4·9	2 5
Straws—			
Barley straw	23	0·7	1 9
Bean straw	23	1·7	1 11
Oat straw	20	0·9	1 6
Wheat straw	13	0·1	0 16
Grains and seeds—			
Barley	71	6·2	4 18
Beans	66	20·0	6 1
Oats	60	7·6	4 8
Peas	69	18·0	6 1
Wheat	72	9·6	5 7

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6*d.* net.

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv %
Wheat, British	—	—	5 10	0 10	5 0	72	1 5	0 76	9·6
Barley, British feeding	—	—	6 12	0 7	6 5	71	1 9	0·94	6·2
„ Canadian No. 3 Western	18 6	400	5 3†	0 7	4 16	71	1 4	0·71	6·2
„ Persian	19 9	„	5 10	0 7	5 3	71	1 5	0·76	6·2
„ Russian	19 6	„	5 10	0 7	5 3	71	1 5	0·76	6·2
Oats, English, white	—	—	7 0	0 8	6 12	60	2 2	1·16	7·6
„ „ black and grey	—	—	7 0	0 8	6 12	60	2 2	1·16	7·6
„ Canadian No. 2 Western	21 0	320	7 7*	0 8	6 19	60	2 4	1·25	7·6
„ „ No. 3 „	16 6	„	5 15†	0 8	5 7	60	1 9	0·94	7·6
„ „ mixed feed	12 6	„	4 7*	0 8	3 19	60	1 4	0·71	7·6
„ Argentine	18 3	„	6 8	0 8	6 0	60	2 0	1·07	7·6
„ Chilian white	25 0	„	8 15	0 8	8 7	60	2 9	1·47	7·6
„ Russian	18 6	„	6 10	0 8	6 2	60	2 0	1·07	7·6
Maize, Argentine	17 9	480	4 3	0 7	3 16	81	0 11	0·49	6·8
Peas, Japanese	—	—	22 10†	0 16	21 14	69	6 3	3·35	18
Milling offals—									
Bran, British	—	—	5 2	0 18	4 4	42	2 0	1·07	10
„ broad	—	—	6 2	0 18	5 4	42	2 6	1·34	10
Middlings, fine imported	—	—	6 7	0 13	5 14	69	1 8	0·89	12
„ coarse, British	—	—	6 2	0 13	5 9	58	1 11	1·03	11
Pollards, imported	—	—	5 7	0 18	4 9	60	1 6	0·80	11
Meal, barley	—	—	6 15	0 7	6 8	71	1 10	0·98	6·2
„ maize	—	—	5 12	0 7	5 5	81	1 4	0·71	6·8
„ „ germ	—	—	5 17	0 12	5 5	85	1 3	0·67	10
„ locust bean	—	—	6 0	0 6	5 14	71	1 7	0·85	3·6
„ bean	—	—	8 0	0 18	7 2	66	2 2	1·16	20
„ fish	—	—	15 0	2 13	12 7	53	4 8	2·50	48
Maize, cooked flaked	—	—	6 10	0 7	6 3	83	1 6	0·80	8·6
„ gluten feed	—	—	5 17	0 14	5 3	76	1 4	0·71	19
Linseed cake, English, 12% oil	—	—	9 2	1 2	8 0	74	2 2	1·16	25
„ „ „ 9% „	—	—	8 15	1 2	7 13	74	2 1	1·12	25
„ „ „ 8% „	—	—	8 10	1 2	7 8	74	2 0	1·07	25
Soya bean cake, 5½% oil	—	—	8 12*	1 10	7 2	69	2 1	1·12	36
Cottonseed cake—									
„ „ English 4½% oil	—	—	5 10	1 2	4 8	42	2 1	1·12	17
„ „ Egyptian 4½% „	—	—	5 2	1 2	4 0	42	1 11	1·03	17
Decorticated ground nut cake, 6-7% oil	—	—	8 10	1 10	7 0	73	1 11	1·03	41
Palm kernel cake, 4½-5½% oil	—	—	6 12§	0 13	5 19	75	1 7	0·85	17
„ „ „ meal 4½% „	—	—	7 2§	0 13	6 9	75	1 9	0·94	17
„ „ meal, 1-2% „	—	—	6 2	0 14	5 8	71	1 6	0·80	17
Feeding treacle	—	—	5 0	0 7	4 13	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	5 2	0 14	4 8	48	1 10	0·98	13
„ „ „ porter	—	—	4 12	0 14	3 18	48	1 8	0·89	13
Malt culms	—	—	4 15†	1 1	3 14	43	1 9	0·94	16
Dried sugar beet pulp (*a*)	—	—	3 15	0 6	3 9	65	1 1	0·58	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of September, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 14*s.* per ton as shown above, the food value per ton is £6 6*s.* Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1*s.* 9*d.* Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94*d.* A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N, 6*s.* 1*d.*; P_2O_5, 3*s.* 8*d.*; K_2O, 2*s.* 11*d.*

MISCELLANEOUS NOTES

Agricultural Machinery Testing Committee

THE undermentioned Certificates and Reports, issued by the Ministry in respect of performances, under test, of agricultural machines, have been printed and issued in pamphlet form. Copies of the respective pamphlets can be obtained, at the prices stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

(*a*) No. 26: A Milk-Cooling Plant, submitted for test by the manufacturers, Messrs. J. & E. Hall, Ltd., Dartford, Kent. (3*d*. net, post free, 3½*d*.)

(*b*) No. 28: The "Fordson" Agricultural Tractor, submitted for test by the manufacturers, The Ford Motor Company, Ltd., Trafford Park, Manchester. (2*d*. net, post free, 2½*d*.)

(*c*) No. 29: The "New Austin" Agricultural Tractor, submitted for test by Sir Herbert Austin, K.B.E., Longbridge Works, Northfield, Birmingham. (2*d*. net, post free, 2½*d*.)

(*d*) No. 34: The "Milpack" Paper Milk Container, submitted for test by the manufacturers, Messrs. Packs (1925), Ltd., Feltham, Middlesex. (2*d*. net, post free, 2½*d*.)

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Pig-keeping Costs

WHAT are the costs of the different items—the sucker itself, food, housing, labour, overheads, etc.—that go to make up the expenditure necessary to produce a pig, whether porker or baconer? A very full answer to this question, under one set of conditions it is true, is given in a Bulletin* just issued by the Ministry. For a period of 7½ years the Lord Wandsworth College has kept detailed accounts of all the transactions relating to its herd of pigs. The herd has been run as an entirely separate venture without assistance or subsidy, and on strictly commercial lines.

The accounts cover the bad as well as the good years, so that a true picture is drawn of the sources and causes of profits or losses. It is not claimed that the system of management adopted is any better or worse than others, but the information gained from the accounts should be of great interest to all pig-keepers, and may reveal unexpected divisions of costs between the different items of pig-farming.

Readers will be interested to note that these accounts were used by Sir Daniel Hall to illustrate many of the points in

* Bulletin No. 33, *Pig-keeping Costs*, obtainable from H.M. Stationery Office, price 6*d*. (7*d*. post free), or through any bookseller.

his "Talks on Pig-keeping" that were broadcast by the B.B.C. and reproduced in this JOURNAL for June, July, and August last.

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The Agricultural Index Number

PRICES of the majority of the commodities used in compiling the index number of agricultural produce were lower during September than in the previous month, and the general figure fell by one point to 20 per cent. above the level of the base years 1911-13, as compared with 42 per cent. a year ago. The most noticeable features for the month under review were the continued downward movement in the prices of fat cattle and sheep and the very low prices realized for new crop wheat. On the other hand, potatoes and new crop barley were considerably dearer on the month and also as compared with the corresponding period last year.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August	49	42	44	52	35	21
September	55	43	44	52	42	20
October	48	40	39	42	29	—
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Following the slight advance in wheat prices between July and August to an average of 6*s.* 4*d.* per cwt. in August, values for new crop, at an average of 4*s.* 9*d.* in September, showed a substantial drop and the index number fell by 16 points to 37 per cent. below pre-war. A year ago the index was 3 per cent. below pre-war, this being the first occasion since 1914 that the wheat index had fallen below the base level. As is usual at the opening of the new crop barley season, values showed a considerable advance, and were, moreover, above those ruling in September, 1930. The average price for the month under review, at 9*s.* 10*d.*, was 2*s.* 3*d.* per cwt. higher than in August, at 18 per cent. above the base period, which compares with a rise of 1*s.* 11*d.* to 3 per cent. above at

the corresponding period last year. Values for oats depreciated by 10*d.* to an average of 5*s.* 7*d.* per cwt., the index figure showing a fall of 9 points to a level of 17 per cent. below pre-war.

Live Stock.—The downward movement in quotations for fat cattle continued during the month under review and the index number declined by 7 points to 22 per cent. above the 1911-13 level. Values for fat sheep also continued to recede, the index figure showing a fall of 7 points to 31 per cent. above pre-war. The average for the month was the lowest recorded since the end of 1915. In the case of fat pigs, prices for porkers were maintained at the previous month's level, but baconers were cheaper, and the relative index number fell by 5 points, while that for porkers also was lower by 3 points. Dairy cows, store cattle, sheep and pigs became cheaper during September, and the index figures for all four classes of stock were lower on the month.

Dairy and Poultry Produce.—The index figure for milk, at 57 per cent. above the level of the base years, was 2 points higher on the month, as compared with a level of 100 per cent. over pre-war recorded a year ago, but it should be noted that prices in September, 1930, were at winter levels. Butter was a little dearer in September than in the preceding month, but as the rise in the base years was proportionately greater, the index figure fell by 3 points to 7 per cent. above the level of 1911-13. Values for cheese moved downwards, the index number falling by 11 points to 12 per cent. above pre-war. Egg prices continued their usual seasonal advance and the index rose by 3 points to a level of 20 per cent. in excess of the base period.

Other Commodities.—Quotations for potatoes were considerably higher during the month under review, and also as compared with September, 1930, although there is a change over in this month to quotations for main crop. The August prices relate to early varieties of potatoes. The index number for September rose by 40 points to 85 per cent. above the level of the base years whereas a year ago the increase between August and September was 26 points to a level of 51 per cent. above 1911-13. Clover and meadow hay were a little cheaper and the combined index figure for hay was 2 points lower at 14 per cent. below pre-war. Apples and plums were dearer than at the corresponding period last year, but quotations for pears were a little lower. The vegetable index was 19 points lower on the month at 41 per cent. above pre-war. Prices

for wool hardened slightly, but were still 30 per cent. less than in September, 1911-13.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	Sept.	Sept.	June	July	Aug.	Sept.
Wheat	31	—3*	—24*	—23*	—21*	—37*
Barley	27	3	—9*	—19*	Nil.	18
Oats..	17	—12*	—10*	—12*	—8*	—17*
Fat cattle	34	35	23	29	29	22
„ sheep	55	62	45	38	38	31
Bacon pigs	52	33	11	Nil.	—5*	—10*
Pork „	55	44	20	10	5	2
Dairy cows	35	31	23	27	25	20
Store cattle..	16	27	28	31	31	23
„ sheep..	63	69	45	53	40	33
„ pigs	83	107	41	31	32	29
Eggs	57	36	2	19	17	20
Poultry	45	40	52	44	31	30
Milk	107	100	48	52	55	57
Butter	52	24	7	10	10	7
Cheese	42	22	25	28	23	12
Potatoes	12	51	100	79	45	85
Hay	42	11	—11*	—13*	—12*	—14*
Wool	47	—8*	—32*	—34*	—31*	—30*

* Decrease.

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Agricultural Statistics, 1930 (Part II)

THE Ministry's Annual Report on the prices and supplies of agricultural produce and requirements, relating to the year 1930-31, was published on September 25. The report sets out the changes that have occurred in the general price level of agricultural produce, in the prices of individual agricultural products and in the prices of the farmer's more important requirements. The effect of these changes on the different branches of agriculture is also discussed. All the more important commodities are noticed separately, with reference to price, imports and total supplies, while in view of the severe decline in cereal prices the international wheat situation is dealt with at some length. The usual statistical tables show the average prices and imports in 1929 of a large number of agricultural products with, in many cases, comparative figures for earlier years.

Copies of the Report, which forms Part II of the Agricultural Statistics, 1930, may be purchased through any bookseller or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1*s.* 3*d.* net or 1*s.* 4*d.* post free.

Refresher Course for County Poultry Instructors

THE first Refresher Course in Poultry and Rabbit Husbandry, for county poultry instructors, was held at the National Institute of Poultry Husbandry, Harper Adams Agricultural College, Newport, Salop, from September 21 to 26, 1931. Thirty-six county and college instructors attended. The Course, arranged by Mr. P. A. Francis, the Ministry's Poultry Commissioner, and Professor Raymond T. Parkhurst, Director of the Institute, was carried out by the staffs of the Institute and the Harper Adams College, assisted by Mr. E. T. Halnan (*Poultry Section, Animal Nutrition Institute*) and Mr. Michael Pease (*Small Animal Breeding Research Institute*) of the School of Agriculture, Cambridge, with Mr. C. E. Fermor (*Table Poultry Section*) and Mr. J. Edmondson (*Northern Breeding Section*) of the National Poultry Institute Scheme.

Seventeen lectures, eighteen demonstrations, nine talks and two tours were included in the programme, while there were also two meetings of the newly-organized British Association of Instructors and Investigators in Poultry Husbandry.

Previous to the Course, the Small Live Stock Inspectors of the Ministry had, on July 21 last, paid the first of their half-yearly visits to the Institute. The visits of the Inspectors and the Refresher Course for the county instructors should prove of considerable value in opening up the wider aspects of poultry and rabbit husbandry by establishing a better mutual knowledge of the problems confronting the research and the extension workers in this particular field. In this way, particularly through the medium of the county instructors, British poultry-keepers will be able to benefit by the results obtained through the educational and research work of the National Institute.

* * * * * *

Pests and Diseases of Basket Willows

FEW plants are more subject than willows and osiers to attacks from insect pests; they also suffer from fungus pests, although these are less numerous. To enable growers to recognize and deal with these enemies, the Ministry has issued a Bulletin* giving an account of the principal causes of injury and of methods of control. Short descriptions of the pests and diseases and of the damage

* Bulletin No. 29, *Insect Pests and Fungus Diseases of Basket Willows*, obtainable from H.M. Stationery Office, price 6*d*. (7*d*. post free), or through any bookseller.

caused are accompanied by first-class illustrations, and recommendations are made as to methods of control, both direct and indirect.

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Advisory Leaflets

SINCE the date of the list published in the August, 1931, issue of this JOURNAL (p. 467), the undermentioned Advisory Leaflets have been issued by the Ministry. The Leaflets starred are re-issues, without substantial revision, of leaflets in the old series, and have not, therefore, been circulated to leaflet subscribers under the scheme set out in the December, 1930, issue of the JOURNAL.

No. 37. Lackey Moth.
,, 38. Stripe Disease of Tomatoes.
,, 44. The Maintenance of Egg Size.
,, 50. Thistles in Grass Land.
,, 51. Thistles on Arable Land.
,, 52. The Suppression of Weeds.
,, 57. Wingless Weevils.
,, 58. Grey Squirrels.
,, *59. Dodder.
,, 60. Farmyard Manure.
,, 61. Pea and Bean Weevils.
,, 62. The White Rot Disease of Onion Bulbs.
,, 63. Blossom-Wilt of Apples.
,, 64. An Economical Sheep-Dipping Bath.
,, *65. The Magpie Moth.
,, 66. The Raspberry Moth.
,, 67. The Cultivation of Lucerne.
,, *68. The Carrot Fly.
,, 69. Cabbage Butterfly Caterpillars.
,, 70. Cabbage Moth Caterpillars.

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Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held on September 22, 1931, at 7 Whitehall Place, London, S.W. 1, Mr. W. B. Yates, C.B.E., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders carrying into effect the Committees' decisions.

Gloucestershire.—An Order continuing the operation of the existing minimum and overtime rates of wages from October 4, 1931, until October 31, 1931. The minimum rates in the case of male workers of 21 years of age and over are as follows :—

HEAD CARTERS : 36*s.* per week of 60 hours in winter and 34*s.* 6*d.* per week of 58 hours in summer.

UNDER CARTERS : 34*s.* 6*d.* per week of 57 hours in winter and 32*s.* 6*d.* per week of 54 hours in summer.

HEAD SHEPHERDS OR HEAD STOCKMEN : 36*s.* per week of 60 hours.

UNDER SHEPHERDS OR UNDER STOCKMEN : 34*s.* 6*d.* per week of 57 hours, and

ALL OTHER MALE WORKERS 30*s.* per week of 48 hours in winter and 50 hours in summer.

The overtime rates in the case of all classes of male workers of 21 years of age and over are 9*d.* per hour on weekdays, and 11*d.* per hour on Sundays. In the case of female workers the minimum rate is 5*d.* per hour for all time worked irrespective of age.

Nottinghamshire.—An Order cancelling the existing minimum and overtime rates as from October 3, and fixing fresh rates to come into operation on October 4, 1931, and to continue in force until further notice. The minimum rate in the case of male workers of 21 years of age and over is 32*s.* per week of 50 hours in winter and 52½ hours in summer (instead of 50 hours all the year round as at present), with overtime at 9½*d.* per hour on weekdays and 11½*d.* per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 8*d.* per hour.

Pembroke and Cardigan.—An Order continuing the operation of the existing minimum and overtime rates of wages from October 1, 1931, until September 30, 1932. The minimum rate in the case of male workers of 21 years of age and over is 31*s.* per week of 52 hours in winter and 54 hours in summer, with overtime at 9*d.* per hour. In the case of female workers the minimum rate is 5*d.* per hour for a day of 8 hours, with overtime at 6*d.* per hour on weekdays and 6½*d.* per hour for the first three hours of overtime employment on Sunday and 7½*d.* per hour for subsequent hours of overtime employment on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ending October 14 legal proceedings were instituted against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	
Kent ..	Hythe ..	—	0 10 6	2 14 0	1
Kent ..	Seabrook	0 10 0	—	15 0 0	1
Lincoln, Lindsey ..	Louth ..	1 0 0	0 16 0	25 8 10	1
Nottingham .	Retford	3 0 0	2 11 0	27 10 7	4
Stafford ..	Longton	1 0 0	0 8 0	10 0 0	1
Yorks, E. Riding .	Beverley	2 0 0	—	12 0 0	1
Yorks, N. Riding .	Leyburn	*	0 15 6	5 13 8	1
Anglesey ..	Valley ..	0 5 0	—	1 6 0	2
		£7 15 0	£5 1 0	£99 13 1	12

* Dismissed under Probation of Offenders Act.

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Foot-and-Mouth Disease.—Since the note published in the last (October) issue of this JOURNAL, was written, a further outbreak of disease has been confirmed in Pembrokeshire. New centres of disease were also discovered at Walsall, Staffs (September 23), and at Graffham, Hunts (October 5).

National Diploma in Dairying.—The thirty-sixth annual examination for the National Diploma in Dairying was held in September by the National Dairy Examination Board at two centres—the University and British Dairy Institute, Reading, for English students, and the Dairy School, Auchencruive, for Scottish students. Ninety-nine candidates presented themselves (fifty-two at Reading and forty-seven at Auchencruive). Of these, forty-five candidates (twenty-six in England and nineteen in Scotland) gained the Diploma. One candidate at the English centre reached the Honours standard.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Cheshire : Mr. H. Fairbank, N.D.H., has been appointed Assistant Lecturer in Horticulture, *vice* Mr. C. Savidge.

COUNTY AGRICULTURAL EDUCATION STAFFS : WALES

Carmarthen : Mr. J. B. Morrison, N.D.P., has been appointed Instructor in Poultry-Keeping.

Miss E. K. Morgan has been appointed Instructress in Rural Domestic Economy.

PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

Studley College, Warwickshire

Miss Griffiths, B.Sc., M.Ed., has been appointed Lecturer in Botany and Chemistry, *vice* Miss Bryan, B.Sc., resigned.

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NOTICES OF BOOKS

Manual of Fruit Cultivation on a Physiological Basis (*Lehrbuch des Obstbaus auf Physiologischer Grundlage*). By Dr. Fritz Kobel. Pp. 274. (Berlin : Dr. Julius Springer. Price RM.16.)

The author of this volume is the Director of the Research Station at Wadenswil, whose work on fruit pollination is well known throughout Europe, and, as might be expected, the book deals with physiological subjects rather than with the actual practical problems of the orchard. Dr. Kobel discusses such subjects as the manner in which the tree obtains its water and minerals from the soil, the assimilation by the leaves of carbohydrates, and the actions and re-actions of the latter resulting in the formation of blossom and fruit.

Dr. Kobel gives his own story of fruit pollination and fertilization, and draws largely on the work of Messrs. Darlington and Crane in showing the control in fertilization exercised by the chromosomes of the pollen grains, and this section is thoroughly up-to-date and very sound. Lists are given of the sterile and fertile varieties that have been grown at Wadenswil. The English varieties mentioned seem to have displayed their normal characteristics.

The numerous illustrations greatly assist the reader in following the text. The volume will be valued by students of fruit-growing and will enable them to form an idea of the investigational methods of European pomologists engaged on research work.

The Principles of Dairying. By H. F. Judkins and R. W. Smith. 2nd. ed., revised. Pp. 322. (New York : J. Wiley & Sons, Inc. London : Chapman & Hall, Ltd. Price 15*s.*)

This is a well-written and comprehensive book containing much valuable information for the dairy student. The chapters referring to the

facts bearing on the composition of milk are of particular interest. As a textbook it should be of great utility, questions being set by the authors on each of the subjects discussed. This system should help the home worker.

The Farmer's Business: Comparative Conditions in Part of South Oxfordshire in 1923 and 1929. By R. N. Dixey, assisted by W. H. Jones and P. M. Reason. Pp. 27. (Oxford: Clarendon Press. London: Humphrey Milford. Price 1*s*.)

This report, issued under the auspices of the Agricultural Economics Research Institute at Oxford, gives an outline of the adjustments that have been made by the farmers in South Oxfordshire in order to meet the decline in prices obtained for their agricultural produce during recent years. The main adjustments adopted have been an increase in dairying at the expense of corn, quicker turnover in live-stock, and extensive reorganization of labour. It is impossible, of course, to say exactly to what extent the effects of the slump have been mitigated by these means, but this brochure makes it clear, at any rate, that, in the area under review, the agricultural community has not been passive in the face of changed economic conditions.

Factors Affecting the Prices of Livestock in Great Britain: A Preliminary Study. By K. A. H. Murray. (Oxford: Clarendon Press. London: Humphrey Milford, 1931. Price 6*s*.)

The forecasting of prices is one of the most difficult, and at the same time, if successfully carried out, one of the most valuable functions of applied economics. The difficulties are by no means less in relation to farm livestock than in regard to most other commodities. Anything, therefore, which, as this book sets out to do with undoubted success, "leads towards a better understanding of price movements and ultimately to the finer judgment of future prices," must be a useful contribution to the equipment of the agricultural industry in making progress towards a more intelligent direction of production. The book deals separately with cattle and beef, sheep, mutton and lamb, and pigs and pig products. The method of approach in each case, after giving such data as are available with respect to the progress of consumption in this country, is to show the supplies, both home and imported, that have been available in Great Britain during the past 60 years, noting changes in classes of stock and types of meat, as well as seasonal variations in supply. Price variations over the same period are then considered and are related not only to variations in supplies, both cyclical and seasonal, but also to differences in quality. An interesting fact, to which attention is drawn with regard to beef supplies, is that the United States has just experienced one of the low periods of beef production, which occur periodically about every 15 years, without removing the embargo on Argentine supplies. A similar situation is not to be expected for at least another decade. The bearing of this on the suggested possibility of a diminution in supplies of beef to this country from the Argentine, due to a diversion of those supplies to the United States, is obvious. A perusal of this book leads one to the conclusion that the cyclical movements that are a marked feature of prices, at any rate of sheep and pigs, seem to form the most dependable basis for forecasting future price tendencies.

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ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

Wood, H. J.—The Agricultural Atlas of Scotland. (64 pp.) London: G. Gill & Sons, 1931, 3*s.* 6*d.* [63(41); 31(41); 912(41).]

University of Cambridge, Department of Agriculture.—Memoir No. 3: A Brief Summary of the Papers published by the Staffs of the Department of Agriculture and its Associated Research Institutes during the period May 1, 1930—April 30, 1931. (35 pp.) Cambridge, 1931. 1*s.* [01.]

Graham, E.—The Profitable Small Farm. (221 pp.) London: Peter Davies, 1931. 7*s.* 6*d.* [63.191; 63(022).]

Blundell, F. N.—A New Policy for Agriculture. (180 pp.) London: Philip Allan, 1931. 7*s.* 6*d.* [338.1(42).]

Empire Marketing Board.—Imperial Wool Research Conference, 1930. London, Leeds, Edinburgh. Report of Proceedings. (101 pp.) London: H.M. Stationery Office, 1931, 1*s.* [63.761.]

Ministry of Agriculture and Fisheries.—First Report of the Agricultural Machinery Testing Committee. London: H.M. Stationery Office, 1931. 3*s.* 6*d.* [63.17.]

Davidson, J. Brownlee.—Agricultural Machinery. (x + 396 pp.) New York: Wiley; London: Chapman & Hall, 1931. 17*s.* 6*d.* [63.17.]

Uvarov, B. P.—Insects and Climate. [From Transactions of the Entomological Society of London, Vol. LXXIX., Part I, April, 1931.] (247 pp.) [551.5; 63.27.]

Institut International d'Agriculture.—L'Organisation Scientifique du Travail Agricole en Europe. (vii + 244 pp.) Rome, 1931. 40 Lires. [331; 63.191.]

Sorokin, P., and *Zimmerman, C. C.*—Principles of Rural-Urban Sociology. (652 pp.) New York: H. Holt & Co., 1931. [30.]

Grange, C.—Home Bottling and Canning. Fruit, Vegetables, Poultry, Meat including Drying and Salting. (202 pp. + 15 plates.) London: Cassell & Co., 1931, 3*s.* 6*d.* [664.84; 664.85; 664.91.]

Lucas, Elizabeth.—Vegetable Cookery. (350 pp.) London: Heinemann, 1931. 8*s.* 6*d.* [376.3; 63.51.]

Sherman, H. C., and *Smith, S. L.*—The Vitamins. (American Chemical Society Monograph Series, No. 6.) (2nd Edition.) (575 pp.) New York: Chemical Catalog Co., 1931. $6. [612.39.]

Snodgrass, K.—Margarine as a Butter Substitute. (Fats and Oils Studies, No. 4.) (xiv + 333 pp.) Food Research Institute, Stanford University, California; London: P. S. King, 1930. $3.00. [63.72; 63.729; 343.53.]

Royal Horticultural Society.—Index Londinensis to Illustrations of Flowering Plants, Ferns and Fern Allies, being an Emended and Enlarged Edition continued up to the end of the year 1920 of *Pritzel's* Alphabetical Register of Representations of Flowering Plants and Ferns. Prepared under the auspices of the Royal Horticultural Society of London at the Royal Botanic Gardens, Kew, by *O. Stapf.* Vol. VI. Saponaria to Zymum. (570 pp.) Oxford at the Clarendon Press, 1931. £5 5*s.* 0*d.* [58.2.]

British Museum (Natural History).—Economic Series, No. 8: Rats and Mice as Enemies of Mankind, by *M. A. C. Hinton.* (70 pp. + 2 plates.) (3rd Edition.) London, 1931. 1*s.* [63.269.]

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Agricultural Economics

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NOTES FOR THE MONTH

Rusty Spot in Cheese

EXPERIMENTS designed to ascertain the causes of rusty spot in Cheddar and other cheese have been carried out by the staff of the National Institute for Research in Dairying, Reading.

Since the defect is most prevalent in cheeses that are moist and open in texture, and as infection—particularly in the case of Cheddar cheese—is at its minimum when the texture is close and the cheese true to type, the first series of experiments (November, 1925, to May, 1928) was carried out on cheeses obtained by deliberately varied methods of manufacture. The milk used was from the Institute farm and was in every instance inoculated with large numbers of the red spot organism, which had been grown in special media. With few exceptions, the amount of red spot found in the cheese was nil or negligible from the practical standpoint, and it appeared, therefore, that no amount of manipulation of the method of manufacture could be made to give typical red spot cheese consistently.

From July to December, 1928, the experiments were repeated on the same lines, with the exception that the milk used was obtained from a variety of sources. The results of these experiments were similar to those obtained from the first series, and led to the conclusion that some factor that was present during cheesemaking at an infected farm was absent when the cheese was made in the Institute's dairy.

A third series of experiments demonstrated that the growth of pigment could be neither greatly diminished nor increased by adding at different stages in the manufacture of the cheese a variety of substances previously shown to influence pigmentation ; but it was found that inoculation with a *raw* milk culture of the causative organism produced much more red spot than was obtained with a culture in *sterile* milk, thus suggesting that the miscellaneous flora of the milk played an important part in determining the extent of red spot infection.

With this in mind, a further experiment was carried out in October, 1930. The herd at an infected farm was divided into two parts, one of which was milked in the fields into sterile

utensils with all the precautions usually observed to secure clean milk, and the other half of the herd was milked in the sheds in the manner usual at the farm. The milk from the first group was sent to the Institute and made into cheese, while that from the other was dealt with at the farm by the usual cheese-making methods. No red spot appeared in the cheese made at the Institute, but the cheese made at the farm was heavily infected. Further, the cheese of the next day made in the usual way at the farm was also badly infected. Some of the milk used for the cheese made at the Institute was kept and shown to contain the red spot organism, although no trace of the fault appeared in the cheese.

Bearing in mind the fact that whenever red spot had been appreciable during experimental cheese-making, the bacterial count of the milk had been high, the following conclusions were arrived at :—

1. The most important factor in the growth of the red spot organism in milk is the presence and growth of certain other bacteria, not yet defined. (Investigations on this point are in progress.)

2. The incidence of red spot may be controlled by excluding bacteria from milk during milking, and rejecting milk from udders suffering from disorder.

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Report of the Land Division, 1930

THE recently issued report of the Land Division of the Ministry* deals with the activities of the Ministry during the year 1930 in relation to small holdings, allotments, farm settlements, Improvement of Land Acts, extinguishment of manorial incidents, commons, Universities and College Estates Act, sale of glebe land, Agricultural Holdings Act, agricultural committees, Tithe Acts, destruction of rats and mice, destruction of weeds, etc.

Small Holdings.—This section of the report describes the operations of county councils during the year 1930 under the Small Holdings and Allotments Act, 1926, and tabular statements are appended showing, *inter alia*, the number of applications received and the areas of land acquired by each county council in England and Wales during the year. The progress made during the four years that have elapsed since the passing of the Act is also briefly reviewed, and a table is included

* Annual Report of the Land Division of the Ministry of Agriculture and Fisheries for the Year 1930. H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1*s.* 3*d.* (post free, 1*s.* 5*d.*).

showing the total areas of land held by the various councils for the purpose of small holdings on December 31, 1930.

Allotments.—This section of the report relates to the proceedings of allotment authorities under the Allotments Acts, 1908 to 1925. Statistics are given of the number and acreage of allotments in 1930, including those provided and let by private owners. A table is included showing for each of the larger towns the number of allotments per 1,000 of the population.

Farm Settlements.—Under the Small Holding Colonies Acts, 1916 and 1918, and the Sailors and Soldiers (Gifts for Land Settlement) Act, 1916, the Ministry at present holds six estates having a total area of nearly 11,000 acres. The report describes the administration of these settlements during the year 1930 and includes notes on the results of the cropping season and trading accounts for the year ended March 31, 1931.

Improvement of Land Acts.—The report deals briefly with the year's operations under the Improvement of Land Acts, which enable landowners to execute various improvements on their estates by means of loans repayable by instalments over a period of years.

Extinguishment of Manorial Incidents.—This section deals with the subject of the extinguishment of manorial incidents consequent upon the coming into operation on January 1, 1926, of the Property Acts, 1922 and 1924. Statistics are given showing the number of cases of compulsory and voluntary extinguishments that came formally before the Ministry during the five years 1926-1930.

Further sections deal with the redemption and apportionment of rents under the Property Acts, and the redemption of rentcharges under the Copyhold Acts.

Commons.—The report also refers to the deeds of declaration deposited with the Ministry under the Law of Property Act, 1925, the effect of which is to confer upon the public rights of access, for air and exercise, to the commons concerned. The total area of commons affected by the deposit of such deeds since the passing of the Act is now 16,590 acres.

Particulars of the commons placed under regulation during the year, and of the inclosure or appropriation for special purposes of portions of commons carried out with the Minister's approval, are also given.

Universities and College Estates Act.—The report gives particulars of the transactions effected under this Act, reference being made to the fact that approval was given to loans from

capital moneys in the Ministry's hands towards the cost of reconstruction and improvement of college buildings. The total value of the land sold by the various colleges during the year was higher than that for any year since the "peak" period of 1920 and 1921.

Sale of Glebe Land.—This section gives particulars of the transactions carried out under the provisions of the Glebe Lands Act.

Agricultural Holdings Act.—This section touches upon the Ministry's duties under the Agricultural Holdings Act, 1923. The number of appointments of arbitrators made by the Ministry during the year was the lowest during the past ten years.

Tithe Acts, 1836 to 1925.—A section of the report is devoted to a record of the proceedings under these Acts during the year 1930.

Agricultural Committees.—The constitution of agricultural committees established in accordance with the provisions of the Ministry of Agriculture and Fisheries Act, 1919, is also discussed.

Miscellaneous Activities.—Further sections deal with the destruction of rats and mice, certificates as to agricultural cottages under the Rent Restrictions Acts, the destruction of injurious weeds, and compensation claims under the Defence of the Realm Regulations.

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Education and Research Report for 1929-30

THE Ministry's Report on education and research for 1929–30* is on the lines of reports issued in previous years. For the most part it tells of the consolidation and expansion of work already begun rather than of radical new developments. In his introduction to the report, Mr. H. E. Dale, Principal Assistant Secretary, says :—

> Agriculture, in common with most of the great industries in this country, is passing through a period of severe depression. No system of research and education could save it from suffering in the present crisis. Nevertheless, it may be confidently said that if no such system existed in this country, British agriculture would find it even more difficult than it does now to struggle against adverse economic conditions, and that it would struggle with less hope for the return of prosperity.

* Ministry of Agriculture and Fisheries : Report on the Work of the Research and Education Division for the year 1929–30. His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1*s.* 3*d.* (post free 1*s.* 5*d.*).

The section of the Report that deals with *agricultural research* reviews the work of the year under the following headings: (1) The administration of grants for agricultural research in England and Wales, of which the most important are the annual block grants made from the Development Fund to the eighteen State-aided Research Institutes. Tables of these grants, of capital grants from the same source, and of miscellaneous grants, both from the Development Fund and from the Ministry's own funds, are given. (2) Agricultural research of an Imperial aspect, including the administration of grants from the Empire Marketing Fund, of which a complete list is given. (3) Local investigation and advisory work carried out by various advisory officers in agricultural chemistry, entomology, mycology, economics, veterinary science and dairy bacteriology stationed at the 14 advisory centres in England and Wales. (4) Miscellaneous experimental and demonstration work, including demonstrations of agricultural machinery, the work of the Foot-and-Mouth Disease Research Committee and of the Agricultural Machinery Testing Committee, and work on sugar-beet mainly financed by the beet sugar factories. (5) The provision of technical advice. (6) Post-graduate scholarships, travelling research fellowships, and grants for the representation of British agricultural science at international conferences. Lists are given of the scholarships awarded in July, 1930.

The next part of the Report is devoted to *agricultural education*. Perhaps the most important event of the year was an effort made by the Ministry to enlarge the scope and increase the efficiency of the agricultural education provided by county councils in England and Wales. To that end a circular letter was issued to local authorities in November, 1929, and the Report indicates the developments that took place in consequence, including increases in staff and extensions of farm institutes. Statements are given indicating the maintenance and capital grants made to Agricultural Colleges and University Departments of Agriculture, and the number of students taking courses at Agricultural Colleges and University Departments of Agriculture and under arrangements made by local authorities. The National Association of Young Farmers' Clubs, to which the Ministry is making grants on a diminishing scale, continues to make steady progress. Reports are given of the working of the Ministry's scheme of scholarships for the sons and daughters of agricultural workmen and others, and of the sugar-beet regional prize and demonstration scheme

that was financed by the Beet Sugar Factories' Committee of Great Britain.

The section on *dairying* records work done by local authorities with the co-operation of the Ministry to secure a higher hygienic standard of milk throughout the country. It includes clean milk competitions, milkers' competitions, extension lectures and courses for sanitary inspectors. The Ministry's activities in connexion with poultry were, during the period covered by the Report, largely centred on the World's Poultry Congress held at the Crystal Palace in July, 1930. In the counties the number of egg-laying trials continued to increase, and recent developments included the institution of cockerel-breeding schemes and approved poultry-breeding station schemes. Particulars are also given of the Stud Goat Scheme.

The final section of the Report is devoted to *horticulture*, and gives particulars of the scheme of horticultural education in the counties, with special reference to demonstration plots established in some counties and the encouragement of the cultivation of crops suitable for canning. It includes details of the activities of the Ministry in certifying plants, potatoes, etc., for export; of the voluntary schemes for the inspection and certification of growing crops; and of the measures taken under the Destructive Insects and Pests Acts to guard against the introduction of dangerous plant diseases and pests, notably the Apple Fruit Fly from the U.S.A. and the Cherry Fruit Fly from Europe.

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Artificial Fertilizers in Modern Agriculture

THE Ministry has from time to time issued monographs describing the work and the results achieved at the various Research Institutes in this country. The latest of these volumes* has now been published in the Ministry's series of Bulletins, and stands to the credit of Sir John Russell and the staff of the Rothamsted Experimental Station. Although to some extent a history of Rothamsted, this aspect is not stressed, and the main aim of the Bulletin is to summarize and place before the farmer in a readily understandable form the lessons to

* Bulletin No. 28, *Artificial Fertilizers in Modern Agriculture*, obtainable through any bookseller or from H.M. Stationery Office, price 3*s*. (3*s*. 5*d*. post free); cloth edition 4*s*. (4*s*. 6*d*. post free).

be learned from experiments with fertilizers, and their applications in every-day farm practice.

After a brief but very interesting chapter on the history of artificial fertilizers, Sir John Russell and his colleagues proceed to deal, in the main part of the Bulletin, with the three groups of fertilizers—nitrogenous, phosphatic and potassic. They discuss the properties of the various fertilizers included in these groups, their interchangeability and their suitability for the different crops as demonstrated by experiments conducted in Britain, on the Continent and elsewhere.

In a later section, suggestions are made for the systematic manuring of all the ordinary farm crops; and the Bulletin concludes with a brief chapter on the new, concentrated, complete fertilizers that are now being introduced.

Throughout the Bulletin, economic considerations receive due attention, since at the present time the farmer has to consider very carefully what crops will repay increased expenditure on fertilizers, and the limits to which such expenditure can profitably be carried.

In short, Sir John Russell has set out the practical application of recent investigations on fertilizers with his accustomed lucidity, and the reader has here in a small compass a sound guide to the purchase and use of artificial fertilizers.

The Bulletin includes an appreciative foreword by Sir Daniel Hall, is fully indexed, and runs to over 200 pages. It is attractively bound in a stiff art-paper cover. The volume will prove a necessary acquisition for regular use, and as a permanent addition to the agricultural library a strongly-bound cloth edition is also available.

* * * * * *

George Washington and Agriculture

THE life and work of outstanding English farmers who lived in the eighteenth century have been written about extensively; Coke of Norfolk, Sir John Sinclair, the Duke of Bedford, Young, Bakewell and others are almost household words amongst those who are interested in the development and progress of English farming.

Although the conquest of the soil of the United States has been accomplished in a very brief space of time, there is, at least in this country, very little knowledge of the outstanding characters to whose determination, courage and judgment America owes its rapid progress. So far as George Washington is concerned, of course, he has been the hero of a fairy story for generations, but perhaps very few of us realize that George

Washington, besides being the hero of a revolution, was a man of very great capacity both in the matter of farming and its improvement and in the foresight with which he discerned the values that would presently arise in America.* Perhaps some of the most interesting details that may be discovered about his undertakings are to be found in his own personal papers, amongst which there are data for a very comprehensive story of the development of the particular countryside in which he was interested over a period of 40 years. This bibliography shows, of course, that a great deal has already been written about him, but most of the books and articles have been published in America, only a few being available in England.

When Washington was farming in America very few of his contemporaries were interested in improved methods. They were far too occupied in the primitive methods of land reclamation that are characteristic of frontier conditions, and difficulties of transport and communication found them so far removed from civilization that the winning of a subsistence was a sufficient reward for their efforts. Washington practically developed his farm at Mount Vernon as an experimental station, partly to learn for himself the best methods he could adopt and partly to teach others. He tried crops that were then not thought of by the generality of American farmers, but which have since become the commonplaces of their system, and in addition he tested various fertilizers and imported improved types of ploughs. He also carried on a correspondence with the famous improvers in England, and some of this has been preserved to us. Amongst others of his personal papers are to be found records of costs and other data that illuminate the conditions under which farming was carried on in eighteenth-century America.

For anyone who should wish to learn more about this great personality, either for its own sake or in relation to the farming of the time and place, this bibliography forms a sure and complete guide.

* *George Washington and Agriculture: A Classified List of Annotated References with an Introductory Note.* By Everett E. Edwards. U.S. Dept. of Agric., Bibliographical Contributions, No. 22. Sept. 1931.

A WELSH SHEEP CONFERENCE

A WELSH National Conference on the breeding and marketing of sheep was held at Aberystwyth on November 4-5. It was organized by the Welsh Department of the Ministry of Agriculture on lines similar to the Conference on the breeding and marketing of cattle held at the same centre three years ago. The sheep-breeding industry is of supreme importance to Wales, and it is well, therefore, that breeders should be given an opportunity of meeting representatives of other interests connected with the sheep trade, thus enabling them to discuss the various problems that confront them at the present time. There was a large and representative gathering of farmers, butchers and agricultural teaching staffs of the Colleges and Counties, as well as of others specially invited from outside the Principality.

Sir George B. Bowen, Chairman of the Council of Agriculture for Wales, presided over the first session, when Professor A. W. Ashby, of the Agricultural Economics Department, University College, Aberystwyth, read a paper on the sheep position in Wales and the outlook in sheep farming. He reviewed the position generally and stated that the exchange situation arising as a result of this country's departure from the gold standard was not likely to cause any considerable rise in the price of mutton and lamb. It might, however, stimulate the demand for wool and, in particular, the export of British wool.

The second session was presided over by Mr. Thomas Williams, ex-president of the National Farmers' Union, and three papers were read in the course of the afternoon.

Professor R. G. White, University College, Bangor, dealt with the subject of the improvement of sheep, and of methods of management for the production of mutton and lamb under Welsh conditions. He explained the characteristics of an improved sheep and pointed out that if the growth of such an animal is retarded by inadequate feeding the change of its body proportions as compared with a well-fed animal is also retarded or even prevented. In consequence the animal, though possibly possessing the inherent ability to grow into a prize winner, remains pretty much the shape of its younger days.

He directed attention mainly to hill sheep and the importance of hardiness in hill flocks, and emphasized the necessity for the exercise of care in determining the policy to be pursued

for the improvement of the mountain flock. Sufficient attention was usually paid to the mutton points of an ideal sheep for the butcher, but he pointed out the supreme importance of the capacity of the sheep for milk-production, for which the Welsh mountain ewes had a reputation. The best policy in the selection of lambs to keep for breeding purposes was to select from twins, as there was some ground for believing that prolificacy and milk-production were in some way associated. Points that were of value to the butcher should not be pushed to the extreme if their development tended to lessen the animal's ability to thrive under the conditions prevailing on the hills. Moreover, it was necessary to stress the importance of properly regulating the grazings of the hills, which was impossible without proper fencing and sub-division of the land.

Mr. J. A. Fraser Roberts, Institute of Animal Genetics, University of Edinburgh, read a paper on the improvement of wool, in the course of which he pointed out that the price obtained for wool was determined primarily by its fineness—the finer the wool the more suitable it was for the manufacture of the more expensive materials. Welsh Mountain fleeces showed enormous variation as regards fineness, ranging from fleeces that were as fine as the Southdown to fleeces that were as coarse as the Blackface. Simple selective breeding could rapidly increase the fineness of the wool clips. A great improvement in quality could be effected merely by selecting stock carrying short and dense fleeces. It was very doubtful whether there was an essential connexion between the presence of kemp in the fleece and the hardiness of the sheep. The farmer should select for a thick, hairy birth coat and an adult fleece practically free from kemp. Red kemp was particularly objectionable to the manufacturer because the bulk of Welsh wool is used for making undyed cloths. Welsh wool was a particularly valuable type of wool possessing a special softness to the touch, which made it very valuable for the very best sorts of tweed.

Suggestions that many might regard as revolutionary were made by Professor R. G. Stapledon, of the Welsh Plant Breeding Station, in a paper on the improvement of sheep pastures with special reference to hill grazing. Professor Stapledon stated that the large tracts of hill land in central and west Wales could be divided into three main types—(1) the *Molinia*, or flying bent, swards, (2) the *Nardus*, or mat grass, pasture, and (3) the fine bent-fescue pastures, heath

and mountain. The improvement of pastures turned on two things—the introduction and maintenance of clovers where before there were none, and the substitution of better grasses for those that are present. He was satisfied that this was possible on the Welsh hills and that it could be accomplished by (*a*) using a caterpillar tractor and a disc plough in the late summer for breaking up the surface of the matted pastures, (*b*) allowing the broken up surface to suffer the action of winter frosts, etc., (*c*) applying sufficient phosphatic or nitrogenous fertilizers, not to create tremendous soil fertility, but merely to help the seeds, especially clovers, to establish themselves, and (*d*) sowing seeds—seedmen's cleanings at the rate of 1 cwt. to the acre supported by the farmers' own loft sweepings. He was convinced that the Welsh hill sheep-walks were suitable subjects for improvement on an economic basis, but he did not advocate tackling indiscriminately all the sheep country of Wales—improvement should be undertaken on carefully selected parts of every sheep run.

The evening session of the first day was presided over by Professor J. J. Griffith, University College, Aberystwyth, when Dr. R. F. Montgomerie, Adviser in Veterinary Science at University College, Bangor, read a paper on the diseases of sheep. He referred to the diseases encountered by him in the six counties of North Wales under three headings—(1) some diseases characterized by more or less sudden death, (2) some diseases of pregnancy and lambing, and of the young lamb, and (3) some parasitic diseases. Dr. Montgomerie dealt at length with lamb dysentery and liver fluke diseases and the methods for their prevention and treatment.

Professor R. G. White presided over the morning session of November 5, when Mr. J. Llefelys Davies, of the Department of Agricultural Economics, Aberystwyth, read a paper giving a general review of the trade in Welsh sheep and dealt at length with the trade in draft ewes and store sheep, and the fat sheep and lamb trade. Particulars were given of the export of sheep from Wales to industrial centres during different periods of the year. He stated that, in the Welsh Mountain sheep, breeders and feeders in Wales had unequalled material for the extension of the draft ewe and fat lamb trade, but there was much need of organization for marketing purposes. Consumers showed a definite preference for the small well-finished carcass, and farmers should, therefore, make an effort to supply products to meet this demand and thus secure the best prices.

Professor A. W. Ashby took the chair at the afternoon session of the second day, when two papers were read.

Major W. H. Warman, of the Markets Division of the Ministry, read a paper on the organization of the trade in Welsh mutton and lamb under the National Mark Scheme, in the course of which he referred to a report, published by the Ministry, recommending the institution, when circumstances permit, of a scheme for applying the National Mark to mutton and lamb. It would be impracticable to maintain an adequate staff of Government graders to carry out the actual grading and marking in the case of the numerous privately-owned slaughter-houses in country districts which did a large trade in mutton and lamb. Except, therefore, for the consuming areas, it had been suggested that registered owners should be entitled to grade and mark under the supervision of travelling inspectors, a factor that had a bearing on marketing organization when, as in the case of Wales, the bulk of the export trade was in live supplies for slaughter in the abattoirs of such cities as Manchester and Birmingham.

The marking of mutton and lamb would eventually open the way to outright sale on a grade and dead weight basis, thus eliminating the losses inherent in the commission system. A committee was at present sitting on the subject of central slaughtering. If such a policy were adopted, and if the National Mark were applied wherever there was a central abattoir, the effect on marketing methods would be profound. Farmers, however, would not receive a fair share of the consequent benefits unless there was greater control of marketing, and it rested with them to take full advantage of the facilities afforded by the Marketing Act.

In applying the mark to cattle, it had been decided to ignore distinctions of breed. This was even more necessary in the case of sheep, but there was some justification for including in the mark a general indication of the area from which the supplies had been derived. If such a system were adopted butchers wishing to build up a trade in Welsh lamb could guarantee genuine supplies.

Mr. Morgan Jones, also of the Markets Division of the Ministry, read a paper on the marketing of wool. The British clip, which provided roughly one-tenth of the total needs of the home consuming industry plus a similar amount for export, was produced in small units by individuals possessing neither the knowledge nor the time for marketing the product on an equitable basis. It was clearly necessary to adopt some method

that, while aiming at a greater uniformity in the grade of wool offered, would make it possible to market lots of increased size. Overseas experience and the experience of English wool co-operative societies was available for guidance in this matter. In any event, a market organization for wool should provide facilities for assembly, storing, grading and bulking, selling and credit. It remained for the Principality to decide whether the peculiar difficulties of its wool trade could more satisfactorily be overcome by one organization or several organizations, but, in either event, the Agricultural Marketing Act provided the basis for any necessary scheme.

In the discussions that took place during the Conference the following, amongst others, took part—Mr. Alfred Mansell, Shrewsbury ; Mr. F. Manley, Manchester ; Mr. T. H. Edwards, Aberystwyth ; Capt. G. L. Bennett Evans, Aberystwyth ; Mr. Mervyn T. Davies, Vice-President of the National Farmers' Union ; Mr. J. C. Jones, Montgomery, representing the Kerry Hill Sheep breeders ; Mr. W. J. Price, Auctioneer, Brecon ; Mr. Tom Lewis, Welsh Agricultural Organization Society ; Mr. Isaac Jones, Principal of the Denbighshire Farm Institute ; and Mr. Simon Davies, Cardiganshire.

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LAND DRAINAGE WORKS IN THE MIDDLE LEVEL DISTRICT OF THE GREAT OUSE CATCHMENT BASIN

IN this JOURNAL for October, 1929, some information was given with regard to certain extensive land drainage operations that were being carried out in the Middle Level Drainage District in the Ouse Catchment Area, with financial assistance from the Unemployment Grants Committee.

One of the illustrations that accompanied that article showed the hutted camp which was then under construction in connexion with the building of a new Sluice and Pumping Station for the outlet of the Middle Level Main Drain at St. Germans, where waters from some 174,000 acres discharge into the River Ouse.

Since that date considerable progress has been made with this scheme. When the writer of these notes visited the site in August, 1930, the excavation for the necessary sluice had been completed to a depth of about 40 feet. The position now is that nearly 1,000 30/40 feet reinforced concrete piles have

been driven into the bottom of the excavation, and have now been consolidated by concrete.

Fig. 1 shows a general view taken from the south side of the sluice foundations, with the tops of the piles showing above the existing surface. The pile driver on the right of the picture is about to drive another pile, which is in position against the pile driver. Some of the pile tops have already been cut away leaving only the steel reinforcement projecting, the better to hold the further layer of concrete which is about to be superimposed to form the raft on which the sluice will be built.

Fig. 2 shows a nearer view of the foundations. This picture is taken from the outfall end of the sluice looking upstream.

Fig. 3 shows generally the works yard with, in the middle foreground, the reinforced concrete piles being made in their shuttering. In the middle distance is an apparatus for washing the gravel used for concrete mixing. The Middle Level Drain is seen on the right of the picture. Ultimately it will continue straight on its present course through the new sluice. At the moment it turns right handed and follows the loop shown on the left of the picture.

The sluices will be provided with two openings each 35 ft. wide, as against the present sluice (which will be allowed to silt up) which has three openings, each 17 ft. wide. The new sluice will also be provided with three Gwynne pumps (with room for a fourth), and it is mainly for the purpose of taking these pumps that so massive a structure is required. Each pump, which will be driven by a Crossley-Premier 8-cylinder 4-crank *vis-à-vis* horizontal 1,000 h.p. oil engine, will be capable of lifting 833 tons of water a minute. Some idea of the magnitude of the pipes required is shown in Fig. 4. The diameter of the pipe is in striking contrast to the motor car inside the pipe, and still more so in relation to the diminutive pump in the foreground (in front of the car).

The installation, which is being constructed under the direction of Major R. G. Clark, M.Inst.C.E., Engineer to the Middle Level Commissioners, and will not be completed for another eighteen months or two years, is designed to secure the adequate removal of all excess water (even in times of most serious flooding) from the Middle Level District, which contains some of the richest agricultural land in England.

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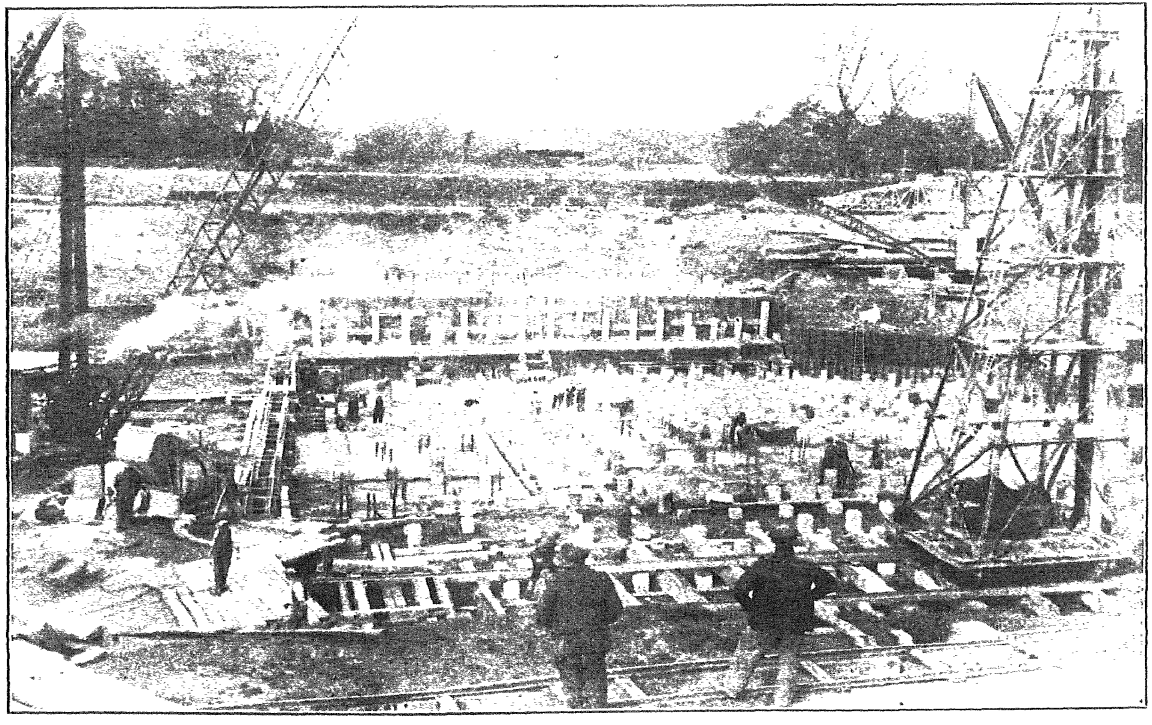


FIG. 1.—General view of the sluice foundations, from the south, Middle Level Drain outlet at St. Germans.

LAND DRAINAGE WORKS IN THE MIDDLE LEVEL DISTRICT OF THE GREAT OUSE CATCHMENT BASIN.

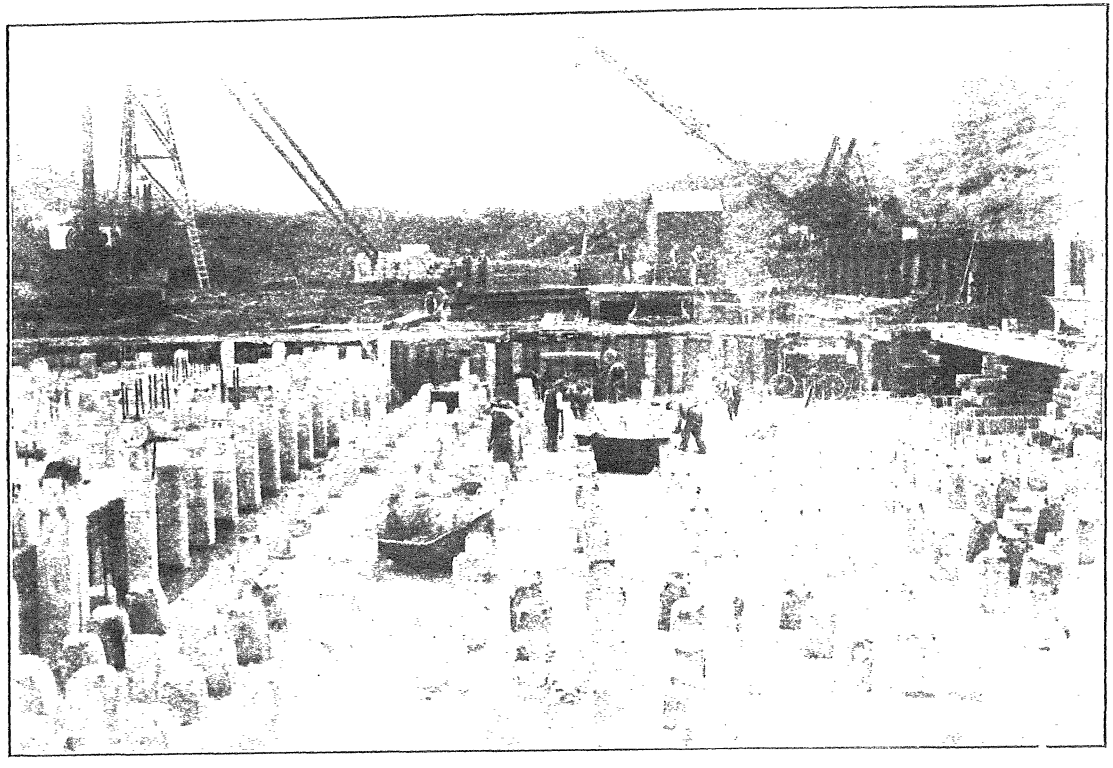


FIG. 2.—Nearer view of the sluice foundations, taken from the outfall end of the sluice, looking upstream.

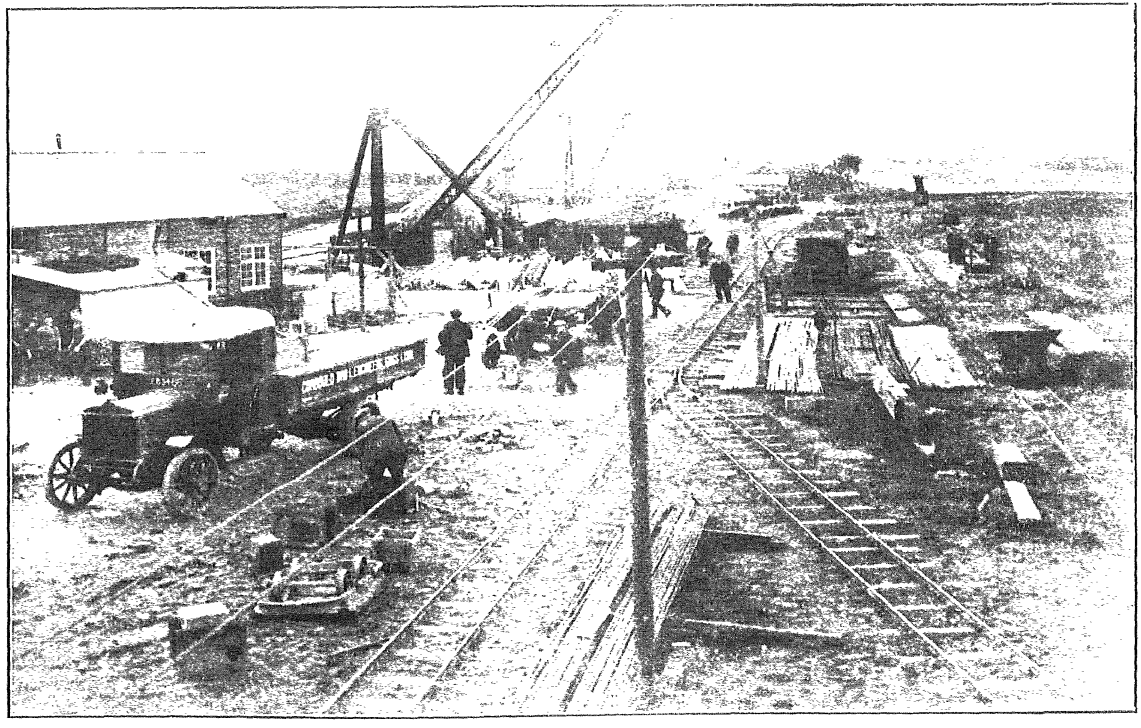


FIG. 3.—View of the works yard with, in the middle distance, reinforced concrete piles being made in moulds for the sluice foundations.

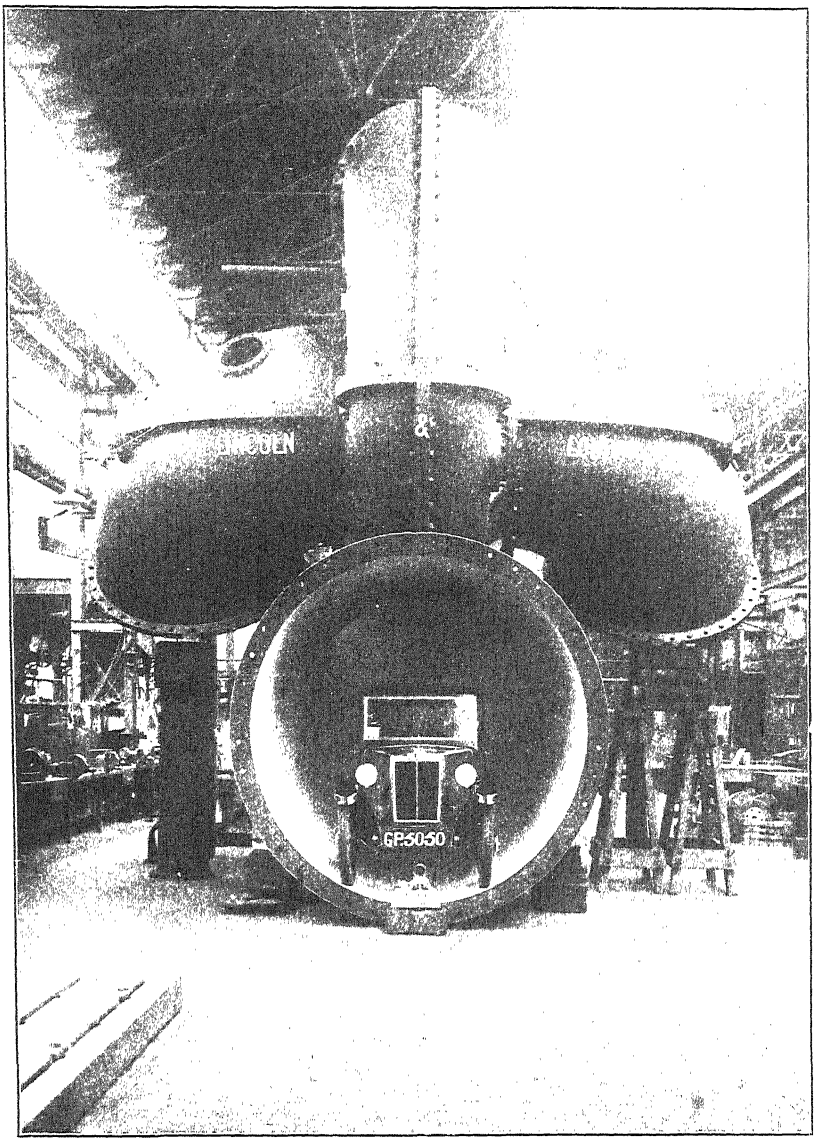


FIG. 4.—One of the three pumps of the new sluice.

THE IMPERIAL FRUIT SHOW, 1931

ON entering the City Hall, the visitor to the recent Imperial Fruit Show at Manchester was compelled to stop and admire the brilliantly staged exhibits arranged by the Empire Marketing Board. Every fruit-producing country in the British Empire was represented by an exhibit of its chief products. Australia showed apples and also dried and canned fruits; New Zealand—apples and honey. Incidentally, the apples, still in excellent condition, must have been gathered as long ago as last Christmas. A large stall of products from Canada embraced all its fruit-growing districts—Nova Scotia, Ontario and British Columbia—and a superb display of wonderful apples was shown. South Africa showed oranges, mainly the late Valenciennes type now available, besides grape fruit and canned products; Rhodesia also showed oranges of excellent quality. The important pineapple industry was the chief feature of the exhibit of British Malaya, which supplies 87 per cent. of our imports of canned pineapple (chunks and slices), equivalent to 60,000 tons annually.

Orange marmalade, orange and lemon squash, pomegranates, aromatic seeds such as aniseed and cumin, broad beans, honey and other products of the Mediterranean were shown in the exhibit of Cyprus, which is establishing an important trade connexion with Great Britain.

Bearing the stamp of the National Mark, a great variety of products of high quality represented the home producer of Great Britain. Trays of delicious-looking dessert apples included the varieties Cox's Orange Pippin, Charles Ross, Lord Lambourne, Ellison's Orange, Rival and Allington Pippin; in these the flavour for which English apples are unrivalled is fully developed. Trays of Comice and Conference pears were also shown, besides examples of glasshouse produce—tomatoes, cucumbers, roses, carnations and chrysanthemums—canned and bottled fruit and vegetables, honey and cider. Northern Ireland had an exhibit of seed and ware potatoes of selected varieties, including Arran Victory, which is said to be the most popular variety in Ulster, where 51,174 acres were grown last year. Scotland also showed examples of the seed potatoes for which it is famed, and a pamphlet listing members of the Scottish Seed Potatoes Trade Association indicated a sound principle of establishing a direct business connexion with prospective buyers. Seed potatoes from the Irish Free State were also on view,

with those from Donegal and those from the bogsoils of Athlone.

The Ministry of Agriculture stall, prepared by the Markets Division, was mainly devoted to an exhibit of National Mark apples and pears, canned fruits, cider, honey, tomatoes and cucumbers. It also included an exhibit of newly-devised methods of presenting strawberries and cherries in a convenient form for the purchaser ; for example, six chip baskets each containing about a pound of fruit and covered with cellophane were packed in a non-returnable lath crate. The exhibit of commercial samples of foreign apples showed the type of package with which the British producer has to compete, and the exhibit of the different results of properly-managed and indifferent spraying showed not only the financial assets but the basic necessity of scientific treatment if apples fit for special packing are to be obtained.

Research Stations.—The Long Ashton Horticultural Research Station, by charts and exhibits illustrating the chemical analysis of juices from different varieties of apples, showed why blending of varieties is generally necessary to make the best cider. The juice from Bramley's Seedling and Cox's Orange Pippin is unbalanced for cider making, containing the wrong proportions of acid, tannin and sugar. A balance in the juice could be made by mixing these juices with that of Dabinett—a variety rich in both sugar and tannin.

The exhibit of the Research Station of East Malling dealt specially with the Beetle and Cane Spot of Loganberries, and the Mite of Strawberries, these being major problems of the growers of crops for the canning factories.

The Fruit Preservation Research Station of Campden exhibited varieties most suited for canning in glass bowls. The effect of high temperature in increasing the number of "hydrogen swells" was demonstrated by charts.

The Advisory Department of the University of Manchester and the Cheshire School of Agriculture had a stall for propagating advisory and educational work.

An Exhibit of "New Apples."—The Royal Horticultural Society showed baskets of apples of all the new varieties included in the Fruit Testing Scheme, and these were examined with much interest by growers who are anxious to discover suitable "dessert" varieties for the commercial orchards.

The numerous trade stands of fruit, fruit packages, fruit journals, spray fluids, machinery and canned fruit were all good. The section for canning machinery was much increased.

Messrs. Geo. Monro, Ltd. (Covent Garden), won the Silver Challenge Cup for the best trade exhibit in the Show. All the machinery was made in England, and in one instance a special pressure retort was entirely of English design.

The Competitive Exhibits.—The Fruit Show proper, in which growers enter their fruit (raw, canned or dried) in competition for prizes, expands every year. Few scab- or pest-damaged fruits are now seen, though many marks are lost by showing specimens that have been abraded and mechanically scarred in the process of picking, grading or packing. There were classes for pears, oranges and grape fruits, for canned fruit (a much enlarged section) and for dried fruits; but the large classes are for apples, the real fruit of the masses, and the product not only of England, but of Canada, Australia, Tasmania, New Zealand and South Africa. There were classes restricted to the apples of each of these parts of the Empire, whilst those for Britain were further sub-divided into a United Kingdom section restricted to "previous non-prizewinners" and an open championship section. Apples from all parts of the Empire meet in rivalry in the Empire Classes. All the exhibits are judged to a score card and the prizes go to the exhibits gaining most marks. The score card, which gives for each exhibit the marks under 10 heads (max. 100), is printed so that each grower can see where his exhibits have strong or weak points.

The chief prizes, each of £50, were given to 50 half-boxes of Cox's Orange Pippins staged by H. Granger (Maldon, Essex) and to 50 boxes of Bramley's Seedlings staged by F. & T. Neame (Faversham, Kent). For dessert apples, open to the whole British Empire, the Silver Challenge Cup and £50 were awarded to 10 boxes of Cox's Orange Pippins staged by Mr. T. B. Douglas (Hatfield Peverel, Essex), and the Silver Challenge Shield and £50 for culinary apples to 10 boxes of Bramley Seedling by F. & T. Neame.

The Cox's Orange Pippins shown in trays, half-boxes and boxes made a great display, and it would seem that supplies of this variety are rapidly increasing under the modern methods of orcharding now practised. The Bramley's Seedling stood out as the premier British culinary apple.

A glance at the many Cox's Orange Pippins (or other varieties for that matter) soon showed that the colours of the apples from some orchards were bright and glowing, so that the apples conveyed the impression of life and sparkle, whilst the colour of others was dull and dingy and the apples made

little eye appeal. This brightness (an alluring asset of much selling value), found in all the apples of some exhibitors and in none of the apples of others, is probably largely influenced by the cultural, manuring and spraying systems practised, and is, therefore, largely within the control of the grower.

The visitor to the Show might admire the wonderful exhibits of fruit in the competitive section, be entertained at the trade stands, and instructed at the Research Exhibits, or receive unconsciously his lesson in geography at the Empire Marketing Board stand, where, incidentally, everyone was invited to take a free sample of Empire fruit and to purchase samples for a small sum from the National Mark girl in her *chic* costume.

Placards emphasizing the importance of "Buying British," and leaflets containing cooking recipes, were freely distributed to enable the housewife to utilize all kinds of fruit and vegetables in the preparation of new but simple dishes. Light forms of amusement were also included, and it is small wonder that the Imperial Fruit Show has become so popular a feature with the general public in the industrial centres that the daily attendances were over 9,000, while over 80,000 people in all visited the show.

Finally, sectional conferences were arranged for growers, canners and distributors. They were well attended and helpful discussions on production, distribution and canning took place.

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REARING SUCKING PIGS

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ALTHOUGH, for many years, the opinions of pig-keepers have differed regarding the value to sucking pigs of a run-out on grass, no previous investigation into the matter seems to have been recorded in this country. It may be of interest, therefore, to give some particulars of two experiments carried out at the South-Eastern Agricultural College (1930–31), in which two groups of sows and their litters were employed. In one group, hereafter referred to as the "outdoor" group, the sows and their litters were allowed to go out to grass at will; in the other, the "indoor" group, the sows were allowed to graze for about two hours daily, one hour in the morning and one in the afternoon, the litters being confined to the sties.

Necessarily, the litters available for such experiments will be few, since, to form a basis for comparison, they must

consist of piglings born about the same time, and be about equal in the number of piglings, *i.e.*, not differ by more than one pig. As a rule, the more numerous the litter, the greater its total weight and the smaller the average weight per pig.

The differences obtained in the trials referred to were constant throughout the litters and were sufficiently marked to be beyond any possible experimental error, despite the comparatively small number of litters employed. The figures given, however, are quoted to show the nature of the differences obtained rather than as a measure of their magnitude.

For comparative purposes, the sows were grouped in pairs after farrowing, according to the size of their litters. One sow in each pair was placed in the "outdoor" group, the other in the "indoor" group. The two sows and their litters in each pair were treated as nearly as possible alike in all respects.

1930 Trial.—The first trial was carried out in August, September and October, 1930, with the first litters of a batch of pedigree Large Black gilts crossed with a Middle White boar. There was a large amount of grass in the runs throughout the period. The dams' ration was 40 per cent. barley meal, 45 per cent. sharps, 10 per cent. maize germ meal, 5 per cent. fish meal, plus 1½ lb. of chalk and ¼ lb. salt per 100 lb. mixed meal, the maximum amount fed being 10 lb. The young pigs were fed behind a creep, being first offered sharps; as soon as they showed signs of eating, a mixture of half sharps and half barley meal was substituted. Finally, when they were eating well, the mixture was changed to 45 per cent. barley meal, 45 per cent. sharps, 10 per cent. pea meal, plus 1½ lb. chalk and ¼ lb. salt per 100 lb. of the mixture. Fourteen farrows were born in the period, nine being reared out of doors and five indoors. From them, four comparable pairs were obtained.

The statement has been made repeatedly that young pigs that have a run-out on grass are more healthy, suffering less from scour and other digestive troubles than those confined to sties. This point received special attention, a careful record being kept of the incidence of scour and other digestive troubles. These were not more numerous than in an ordinary commercial herd. The outdoor piglings were healthy and well up to the average as regards condition and appearance. They were attacked by scour, which, however, yielded to simple treatment, in no case lasting more than 48 hours. The indoor piglings were healthy and well up to the average as regards condition and appearance until a month old. In the second

month, however, their appearance deteriorated, their skins looking "dirty" and their coat harsh; as a result they appeared less thrifty than the outdoor piglings. They suffered from scour, which was much more difficult to control than with the outdoor lot, lasting between three and seven days. Several, when between six and eight weeks old, developed a depraved appetite, showing a desire to drink the drainage from the manure in the sty. Post-mortem examinations of two of the worst pigs showed that they were suffering from anæmia.

The outdoor litters started to eat meal when about a month old and subsequently developed a healthy appetite. The indoor piglings did not start to eat until between five and six weeks old and their appetite was poor. Table I gives the weights of the four comparable litters at six weeks old.

TABLE I.—FIRST EXPERIMENT: LITTER WEIGHTS AT SIX WEEKS OLD.

Outdoor.					*Indoor.*			
Litter of sow No.	No. of pigs	Weight Total lb.	Weight Average lb.		Litter of sow No.	No. of pigs	Weight Total lb.	Weight Average lb.
16	8	181½	22·7	Com-	38	8	137	17·1
40	7	156	22·3	pared	36	7	126	18·0
37	9	213½	23·7	with	35	10	182½	18·2
12	5	138½	27·7		39	4	85½	21·4
TOTAL	29	689½				29	531	
AVERAGE			23·7					18·3

When the piglings were nine weeks old they were inspected by an independent farmer who valued the outdoor lot at 35*s.* per head and the indoor lot at 25*s.* per head, the difference in value being due to the greater weight and more thrifty appearance of the former.

1931 Trial.—The trial was repeated in March, April and May, 1931, with the same sows, which were then rearing their second litters. The season was a late one, and when the trial started there was only a small amount of grass in the runs. The sows received a mixture of 45 per cent. barley meal, 45 per cent. sharps, 10 per cent. fish meal, plus 1½ lb. chalk and ¼ lb. salt per 100 lb. mixed meal, the maximum amount fed being 15 lb. per head, per day. The young pigs were fed as in the previous trial, except that linseed cake meal was used instead of pea meal. Fourteen farrows were obtained in the period, of which nine were reared out of doors and five indoors.

The results were similar to those obtained in the first trial. The outdoor pigs did exceptionally well. All the litters had a slight attack of scour, but, as in the previous trial, this yielded readily to treatment and in no case lasted more than 48 hours. No other sign of digestive trouble was observed in any of the

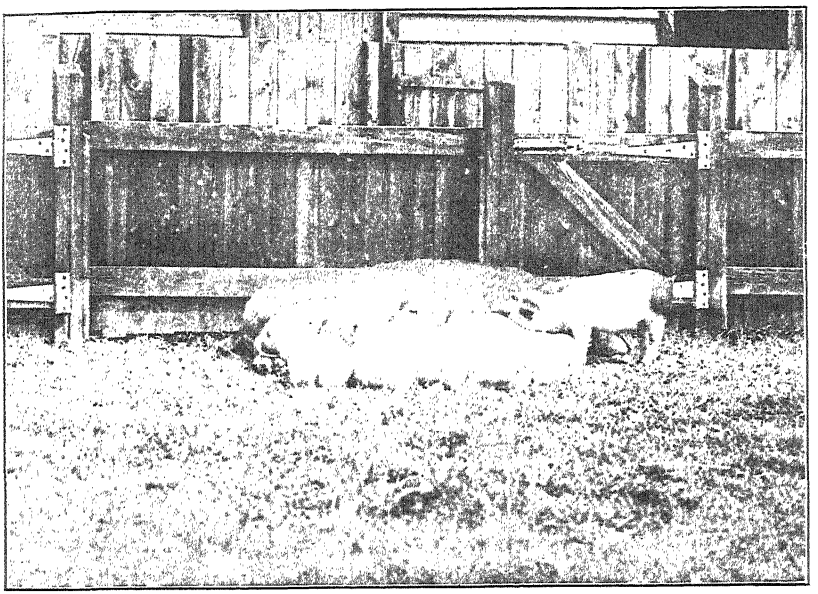


FIG. 1.—In the outdoor group, the piglings were allowed to run out with their dams.

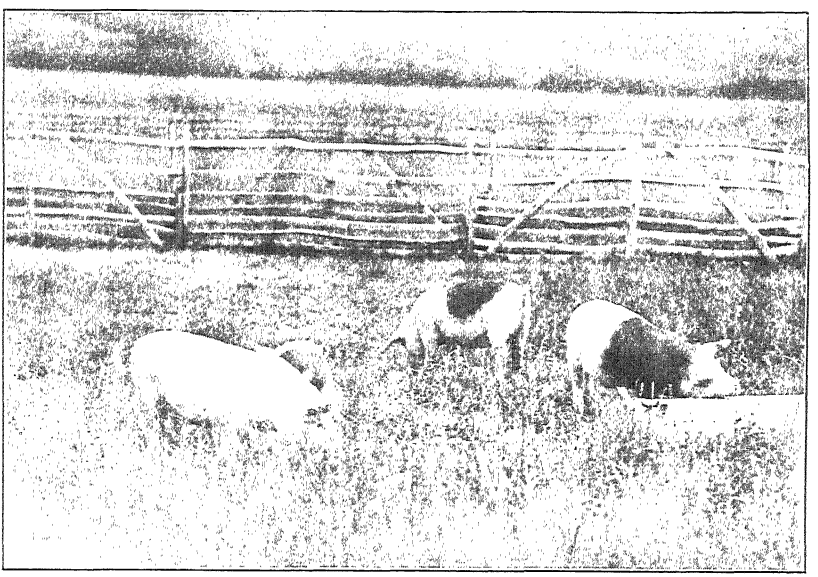


FIG. 3.—The outdoor pigs of the spring litters, which were reared on fresh ground, did exceptionally well after weaning.

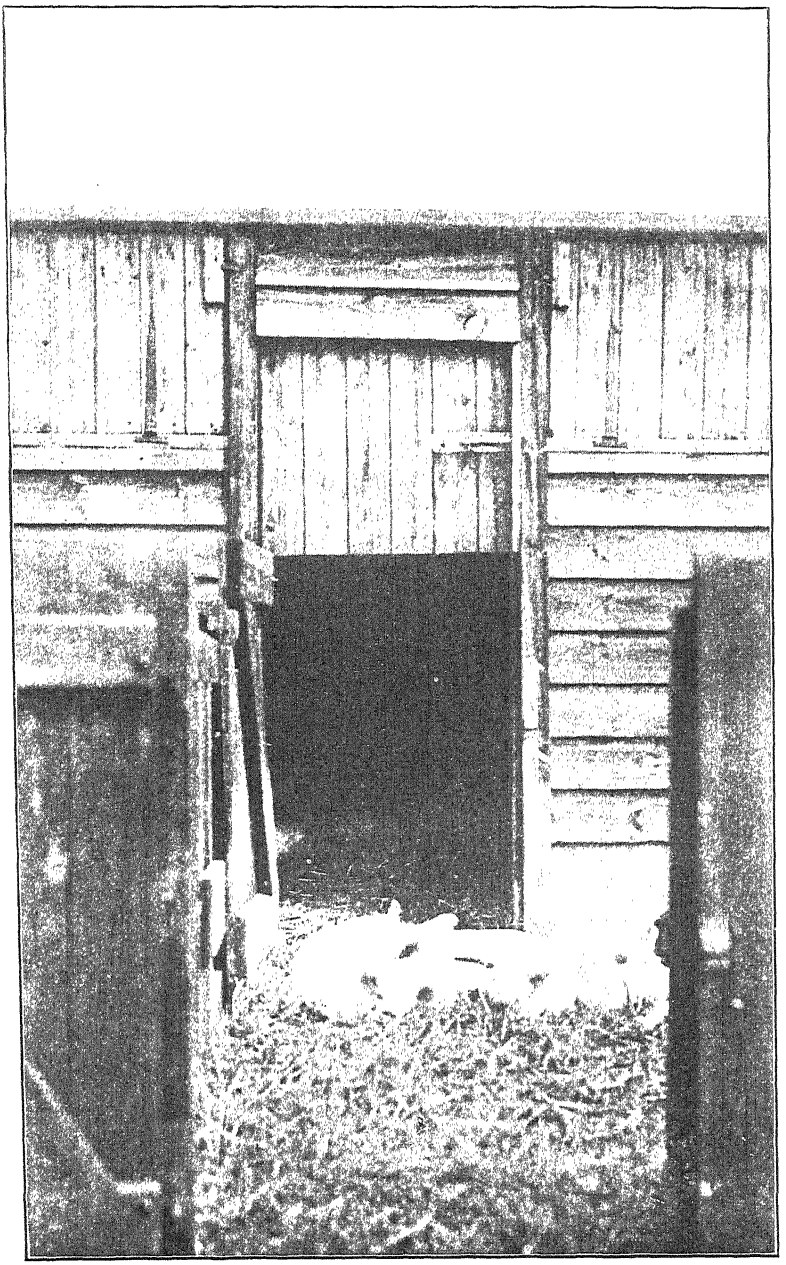


FIG. 2.—In the indoor groups, the sows were allowed out for two hours a day, the piglings being confined to their sties.

nine litters. The indoor pigs did well up to a month old, but showed well-marked signs of deterioration in condition in the fifth week. All the indoor litters were attacked by scour, which was difficult to control, and three piglings developed a depraved appetite indicative of digestive trouble.

All nine outdoor litters started to eat at about four weeks old. One of the indoor group started to eat at four and a half weeks, but the other four showed no inclination to eat before five weeks old.

Table II gives the weights of three comparable litters at five weeks old.

TABLE II.—SECOND EXPERIMENT: LITTER WEIGHTS AT FIVE WEEKS OLD.

Outdoor.					*Indoor.*			
Litter of sow No.	No. of pigs	Weight Total lb.	Weight Average lb.		Litter of sow No.	No. of pigs	Weight Total lb.	Weight Average lb.
40	9	175¾	19·5	Com-	12	8	154	19·2
35	9	157¼	17·4	pared	37	9	141¾	15·7
14	9	157½	17·5	with	16	9	148¾	16·5
TOTAL	27	490½				26	444½	
AVERAGE			18·2					17·1

At this period, the outdoor litters were valued at 2*s.* 6*d.* per pig more than those in the indoor group. The piglings in the litter of Sow No. 12 grew rapidly, but, during the fourth and fifth week, suffered from scour which was very persistent and did not yield to treatment. At five weeks old, the piglings, which were not eating, were still scouring and beginning to lose condition. The litter of Sow 37 had an attack of scour which lasted for four days; after it had ceased the piglings developed a depraved appetite indicative of digestive trouble, they lost condition rapidly and, at five weeks, looked very unthrifty. The fourth indoor litter behaved in the same way. The three litters above-mentioned were allowed to run out on grass at the commencement of the sixth week, and in all three the digestive troubles disappeared in three days and the pigs started to improve in condition from the time they were allowed to run out.

The litter of Sow 16 scoured spasmodically during the fifth week, but responded to treatment. This litter was kept confined until weaned at eight weeks old. Slight indications of digestive trouble were observed during the sixth week, but the piglings did comparatively well though they lacked the "bloom" of the outdoor pigs and made less rapid growth.

Comparison of Autumn and Spring Litters.—Further evidence of the value of a run-out on grass can be obtained by

comparing the spring and autumn litters of the same sows. Table III gives the weights at six weeks old of the litters of four sows :—

TABLE III.—WEIGHTS AT SIX WEEKS OLD OF SPRING AND AUTUMN LITTERS.

Litter of sow No.	How reared		No. of pigs.	Weight Total lb.	Weight Average lb.
40	Autumn	Outdoors	7	156	22·3
40	Spring	Outdoors	9	216	24·0
37	Autumn	Outdoors	9	213½	23·7
37	Spring	Indoors	9	174½	19·4
16	Autumn	Outdoors	8	181½	22·7
16	Spring	Indoors	9	178½	19·8
35	Autumn	Indoors	10	182½	18·2
35	Spring	Outdoors	9	188½	20·9

The autumn litters were the first of gilts, the spring litters being the second ones. Normally a sow's second litter makes better growth than her first, and this did happen in the case of the litters of Sow 40, both of which had a run-out on grass, and also with those of Sow 35 in which the autumn litter was reared indoors and the spring litter allowed to run out. In the case of the litters of Sows 37 and 16, however, the first litters which ran out did better than the second litters which were reared indoors.

All the piglings from the autumn litters received a vermifuge after weaning. It was found that the outdoor piglings were badly infested with worms, but no signs of infestation were found in the indoor litters. American workers record the fact that infestation with parasitic worms is very liable to occur if young pigs are allowed to run on ground which has been previously stocked with pigs. The spring litters were, therefore, put on to fresh land. The growth-rate of these pigs (Fig. 3), subsequent to weaning, was extremely good, and no worm eggs could be found in their excreta, this fact indicating the absence of worm infestation.

Discussion of Results.—The results indicate that, if precautions are taken to prevent losses from parasitic worms, it is easier to rear pigs between March and November when they have a run-out on grass than when they are confined to sties. The outdoor pigs suffer less from scour and other digestive troubles and make more rapid growth than do those confined to sties.

Young pigs which have a run-out on grass will start to eat at about four weeks old, whereas those confined to sties rarely show any inclination to do so until between five and six weeks old.

The diagnosis of anæmia in the indoor pigs of the autumn litters is notable. American observers record the fact that this complaint is more prevalent amongst indoor, than outdoor, reared pigs.

The incidence of parasitic worms amongst the outdoor-reared pigs of the autumn litters reveals a factor that may be a serious drawback to the practice of giving young pigs a run on grass. *When pigs are reared in small runs* these parasites may occasion very serious losses, unless the runs are periodically moved on to fresh ground.

The writer desires to express his appreciation for help received in this work from the Veterinary Research Department of the South-Eastern College, and from Mr. V. R. S. Vickers, the Vice-Principal of the College.

* * * * * *

NEW SYSTEMS OF POULTRY-FEEDING

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POULTRY-FEEDING has undergone many changes in recent years. The old elaborate wet-mash and grain system has been replaced to a considerable extent by dry-mash feeding. We have still a lot to learn, however, and each year brings fresh knowledge, with resulting changes both in rations and in systems of feeding. Until lately, few people in this country had tried the all-mash method; fewer still that of pellet-feeding. To-day, however, many poultry-farmers are using one or other—in some cases, both—of these methods with success.

For the general farmer who grows cereals, it may still be advisable to feed his wheat, oats or barley to poultry if the grain cannot be used or sold to better advantage; but the farmer who has a good market for his grain, or who does not grow corn, may choose either the all-mash or the pellet system, or a combination of both. The all-mash and pellet systems can be combined very easily; the same ration can be given in either form and there is no risk of it becoming unbalanced. With grain-feeding, more labour and skill are entailed; there is risk of the ration becoming unbalanced and greater risk of disease.

The Mash-and-Corn Method.—This means at least two—in some cases, three—feeding periods during the day. The usual method is to have dry-mash available in hoppers all day, to give a small feed of grain in the litter first thing in the morning and, as a last meal at night, a larger amount of grain, fed either in the litter or in open floor-troughs. An addition is sometimes made in the form of a wet-mash, fed either at noon or in place of the evening grain-feed. Where artificial lighting is installed, it is usual to give the last grain or wet-mash feed during the lighting period.

The method is obviously complicated and needs considerable care if a balanced ration is to be maintained. The aim, usually, is to give 2 oz. of grain and 2 oz. of mash per bird per day, but the difficulty is to ensure that the bird consumes the two foods in the right proportions. In the short winter days, it often happens that a hen satisfies her appetite more or less with the regulation 2 oz. of grain, which can be picked-up quickly, but fails, during the short period of daylight, to eat the 2 oz. of mash. The ration eaten is thus unbalanced —2 oz. of grain to 1 or 1½ oz. of mash—yet the poultryman wonders why the winter egg-laying is poor.

The All-Mash Method.—With this method, ample feeding space must be provided—at least 24 ft. run of hopper-space for every 100 birds. Compared with mash-and-grain feeding, the all-mash method has the following advantages :—

(1) It ensures a complete, balanced ration that neither the poultryman nor the birds can upset.
(2) It gives every bird an equal chance of feeding. This means better growth and production.
(3) It is more sanitary than the scratch-feeding of grain.
(4) It saves in labour and skill.
(5) It necessitates only one feeding-period per day.

In some cases, not even the one feeding-period per day is essential; but, in the winter months, it is advisable to fill the mash-hoppers at least once a day, as a fresh supply of food, by stimulating the birds' appetite, helps to keep up their consumption of food. In some types of hoppers, it is sufficient merely to expose a fresh surface of the food.

To ensure a high consumption of food by the birds in winter is one of the problems of all-mash feeding (as it is, also, of grain-and-mash feeding). As there is sometimes a low food consumption with the all-mash method, especially when artificial lights are not used, a wet mash is valuable in supplementing the dry mash. The simplest way to feed the wet-mash is to sprinkle the top-layer of the dry-mash with water,

making the mash on the surface crumbly for the hens to eat. Another method of raising winter consumption is to give a ration with a higher protein content, so that the birds derive the same value from a smaller bulk of food.

Pellet-Feeding.—This method is very similar to the all-mash, except that the pellets may be fed in any type of hopper, or in the litter, if desired. As compared with mash-and-grain feeding, it has the same advantages (1 to 5) given above for the all-mash method.

All-Mash versus Pellet-Feeding.—The respective advantages and disadvantages of the all-mash and pellet methods may be set out briefly as follow :—

All-Mash :—

(*a*) Mash costs, per cwt.. less than pellets.
(*b*) It is necessary to have specially-designed food-hoppers to prevent clogging and waste.
(*c*) The feeding-space necessary usually means additional vessels.
(*d*) It is more wasteful ; mash spilt on the floor is lost in the litter.
(*e*) There is no possibility of feeding it in the litter to give scratching occupation to intensively-kept birds.
(*f*) It is necessary to have short and more expensive litter, as the birds do not scratch and the litter quickly becomes clogged and damp.

Pellets :—

(*a*) These, usually, cost 6*d*. per cwt. more than mash. There is, however, up to 10 per cent. less moisture per cwt. of food.
(*b*) Cheaper equipment is possible. There is no waste or clogging ; any type of trough or hopper may be used, or the pellets may be scattered on the ground or in the litter.
(*c*) Pellets are easier to handle than meals, as they pour like grain.
(*d*) The litter keeps drier if the birds are made to scratch occasionally for pellets. This is very desirable for intensively-kept birds.
(*e*) A crop filled with pellets contains more food (both in weight and nutritive value) than one filled with mash. 13¼ lb. of mash and 15¼ lb. of pellets have the same volume.
(*f*) The birds can eat a crop-full of pellets much more quickly than one of mash.

This last is a considerable advantage in the short winter days, especially for the last feed ; but may be a disadvantage under intensive conditions, as it leaves the birds with more idle time, sometimes conducive to feather-eating and cannibalism. Because of the rate and ease of consumption, it seems that there is the possibility of feeding too concentrated a ration in pellet form, especially with young chicks.

Experiment at the National Institute.—An experiment carried out, for a period of 52 weeks, at the National Institute of

Poultry Husbandry (1929-30),* showed that pellets gave as satisfactory results as all-mash feeding with White Leghorn pullets during their first laying year. A summary of the results, obtained with 210 White Leghorn pullets during their first laying-year, is given below.

The pullets were divided equally, according to sexual maturity and body weight, into six pens of 35 birds each. Except in the case of green food and oyster shell, the rations fed to the six pens were exactly the same throughout; three pens (Nos. 1, 2 and 3) received their ration in the form of mash and three (Nos. 4, 5 and 6) in the form of pellets. Green food and oyster shell were also given. The ration consisted of:—

Yellow maize meal	49 lb.
Bran	14 ,,
Thirds	14 ,,
Meat and bone meal	6 ,,
Dried skimmed milk	6 ,,
Extracted soya-bean meal	6 ,,
Salt	1 ,,
Medicinal cod liver oil	2 ,,
Ground limestone	2 ,,
	100 ,,

Table I gives the average monthly egg-production for each pen with the total egg record for the 13 periods of four

TABLE I.—AVERAGE MONTHLY EGG PRODUCTION PER BIRD

	All-Mash Pens			*Pellets Pens*		
Four-week periods	1	2	3	4	5	6
1. Aug.-Sept. ..	15·31	17·88	17·85	21·28	20·57	17·17
2. Sept.-Oct. ..	16·31	17·50	16·54	17·17	16·50	13·94
3. Oct.-Nov. ..	14·02	18·10	13·90	13·00	12·70	14·60
4. Nov.-Dec. ..	09·94	15·70	12·38	09·80	11·67	12·26
5. Dec.-Jan. ..	11·10	15·20	11·70	11·00	10·30	12·00
6. January ..	09·70	13·50	13·40	10·70	09·50	11·20
7. Jan.-Feb. ..	11·80	16·37	12·80	09·90	11·50	12·40
8. Feb.-March ..	12·33	15·46	14·62	10·60	12·64	11·09
9. March-April ..	13·27	13·38	12·18	14·53	12·90	15·23
10. April-May ..	17·70	18·09	16·09	17·51	17·67	18·18
11. May-June ..	16·76	18·87	15·39	16·50	17·67	17·43
12. June-July ..	16·75	17·33	15·06	15·01	16·10	16·11
13. July-Aug. ..	12·74	14·49	10·94	13·52	13·53	12·95
Total eggs per bird	178·54	212·19	182·49	180·49	184·84	184·46
	Mash pens (total) Average production per bird 191·21			Pellets pens (total) Average production per bird 183·20		

*Full details of the experiment, up to 48 weeks, were reported in Leaflet No. 16 of the National Institute of Poultry Husbandry, August, 1931.

weeks each. These averages have been calculated on the hen-day basis. This method makes allowance for birds that are taken from the pens into hospital and for those birds that die during the course of the experiment. The average production for the year, therefore, does not necessarily correspond to the sum of the averages for the 13 lunar months. The production for all six pens was very satisfactory. Pen No. 2 gave a higher total than any of the others, and the production in this pen was outstanding throughout the experiment.

The average egg-record for each group of pens shows no significant difference between the two groups. (See Table I.)

The size of the eggs was very good in all pens. The three mash-fed pens gave an average egg-weight of 32·15 drams, and the pellet-fed pens one of 32·41 drams. There was no marked difference in shell texture, yolk-colour and quality of the albumen in the eggs produced by the six pens.

Table II shows the average daily food consumption per bird for each four-week period; it was highest from January until May. The mash-fed birds consumed rather more food than those receiving pellets.

TABLE II.—AVERAGE FOOD PER DAY PER BIRD, IN OUNCES
Pens 1, 2, 3 *All-Mash v. Pens* 4, 5 *and* 6 *Pellets*

Periods		
1. Aug.-Sept. ..	3·03	3·02
2. Sept.-Oct. ..	3·24	3·39
3. Oct.-Nov. ..	3·47	3·31
4. Nov.-Dec. ..	3·62	3·48
5. Dec.-Jan. ..	3·88	3·82
6. January ..	3·86	3·67
7. Jan.-Feb. ..	4·00	3·93
8. Feb.-March ..	4·13	3·93
9. March-April ..	4·07	3·92
10. April-May ..	4·03	3·87
11. May-June ..	3·79	3·64
12. June-July ..	3·76	3·57
13. July-Aug. ..	3·80	3·66
Total average ..	3·74	3·63

Summary of Results.—The financial totals for the whole 12 months are given in Table III. With the exception of Pen No. 2 (all-mash), which shows a much higher income than the other pens, there is no significant difference in the figures. In Table IV are shown the average results obtained per bird. Here, again, there is no appreciable difference between the egg-production and the egg-size of the two groups of pens. The pellet birds ate less food and cost more to feed, but they gave a satisfactory margin over feed-cost. All the pens made a satisfactory increase in weight.

TABLE III.—SUMMARY OF TOTALS—52 WEEKS

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5	Pen 6
		Mash pens			*Pellet pens*	
Total No. of eggs	5,989	7,235	6,130	6,212	5,761	6,273
Total income	£ s. d. 44 0 8¼	£ s. d. 54 12 10	£ s. d. 45 13 10½	£ s. d. 45 8 4½	£ s. d. 42 8 9½	£ s. d. 45 16 1¾
Combined income		144 7 4¾			133 13 3¾	
Combined food cost		55 6 0			54 13 10¼	
Combined margin over food cost		89 1 4¾			78 19 5½	

TABLE IV.—SUMMARY OF AVERAGES—52 WEEKS

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5	Pen 6
		Mash pens			*Pellet pens*	
Average percentage production	49·05	58·30	50·16	49·58	50·78	50·67
Combined pens mash percentage production		52·53		Combined pellets	50·33	
		£ s. d.			£ s. d.	
Combined income per bird ..		1 8 6			1 6 10	
Combined food cost per bird		0 10 11			0 11 0	
Combined margin over feed cost per bird		0 17 7			0 15 10	

Consideration of Pellet-Feeding.—The following points, which may be of interest, have been deduced as a result of experiments, extending over a period of 18 months, in the pellet-feeding of White Leghorns of various ages :—

(1) The pellet allows a very useful latitude in methods of feeding. It is a distinct advantage to be able, if necessary, to scatter the feed without fear of waste.

(2) There are distinct possibilities of pellets replacing the laborious wet-mash as a supplementary feed.

(3) Pellet-feeding in plain hoppers, by affording more idle time, tends to promote feather-eating by both chickens and laying pullets.

(4) A good quality, firm pellet is required. Some pellets crumble too easily and very quickly become meal in the hopper.

(5) There is a tendency for leg-weakness to develop in both chicks and adult birds if too concentrated a pellet ration has been fed. Chicks so affected are known as " crazy " chicks.

(6) With young chicks, the size of the pellet is a definite factor ; they must be small enough for the chicks to start feeding.

(7) Pellet-feeding, as compared with the same ration in meal form, results in a more rapid bleaching and a much slower return of the yellow pigmentation of the skin and shanks of yellow-fleshed breeds.

More particular reference has been made here to pellet-feeding than to all-mash feeding, because the latter is now practically established and, except for the litter problem with intensively-kept birds, has been found very satisfactory for the feeding of chicks, layers and breeders. Further experiments will, it is hoped, help to simplify methods of poultry-feeding, and may indicate some ways in which pellet-feeding can be employed to replace or to combine with other feeding-systems.

* * * * * *

POTATO SILAGE

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IN most years, potato growers have quantities of waste tubers in the form of chats, damaged and slightly blighted tubers and perhaps twice- or three-times-grown seed that cannot be sold. In some years, also, the problem of making use of surplus ware potatoes may arise. Where a large head of stock is kept, and the potato acreage on the farm is not great, it may be possible to consume on the farm all these waste and surplus potatoes. On potato-growing farms, however, it frequently happens that the head of stock is not sufficient to consume such potatoes, especially in March, April and May. Also, in years when "blight" is prevalent, there are large quantities of slightly-blighted tubers—not suitable for sale, but good enough for stock feeding—which decay rapidly if not used immediately.

The making of silage affords an easy and inexpensive method of preserving potatoes until they are required. For instance, at this Institute, potatoes from the 1929 potato crop made into silage in May, 1930, were used for feeding bullocks during the winter of 1930-31, and during May, June and July of this year, as a supplement to the feeding of a heavy head of cattle fattened on grass. The clamp was then closed down, and re-opened last month (November). The silage has kept in good condition, and is being readily consumed by stock. Also, partly "blighted" tubers, made into silage in January, 1931, are still in excellent condition, and likely to remain so for some considerable time.

Methods of making Potato Silage.—There are three ways in which potatoes may be made into silage :—

1. By mixing the tubers in a stack silo with a green crop. This method cannot be employed until towards the end of May,

when a green crop becomes available. Silage made by this method is suitable for bullock-feeding, but not for pig-feeding.

2. By cooking the tubers, and placing them in an outdoor pit silo. This method may be adopted at any time when potatoes are available. Partly "blighted" tubers may be preserved by this method. Silage so made is especially suitable for pig-feeding.
3. By slicing the raw tubers, mixing with a little fermented maize meal, and placing in a pit silo as in Method 2.

Method 1.—The Admixture of Potatoes and Green Fodder.—This method was briefly described in the issue of this JOURNAL for April, 1930. Silage has been successfully made, in the manner described, on several farms in Lincolnshire. Observation trials, made in the winter of 1929-30, showed that bullocks fed on a silage made better progress than others fed on a normal, standard ration. The cattle readily consumed the silage, and no trouble was experienced from its use.

In the early summer of 1930 an opportunity occurred on the Institute farm to make potato and green fodder silage on a fairly large scale. About 40 tons of seed and chat potatoes, left over from the 1929 crop, were unsaleable on account of low prices. It was decided to make these into silage, together with the produce of about nine acres of a one year's clover and rye-grass mixture. This crop was cut in the middle of May. Subsequently a good hay crop was obtained.

The site for the silo was marked off and levelled. The green crop was carted directly it was cut, the weather continuing dry during the whole period of the operation. A layer of green crop, one foot thick, was placed evenly over the ground. A layer of one ton of potatoes was then spread evenly over the green crop. The potatoes were put over a riddle to remove loose soil and the young sprouts that had begun to grow. For convenience in handling, the tubers were transported in bags. A run-over heap was made, to secure the necessary consolidation. The green crop and potatoes were placed in alternate layers. When complete, the sloping ends or ramps were cut away and the material thrown on the top. The following day a layer of about six inches of soil was placed evenly over the top and, a few days later, the sides were also covered with soil. A further layer of three inches of soil was also placed on the top. Figs. 1, 2, 3 and 4 show various stages in the making of the silage.

When the silo was opened, very little wastage was found. The grass silage was sweet and pleasant to the smell. Where the heat had been greatest, the tubers were partly cooked, and quite sweet. Where there had been less heat, the tubers

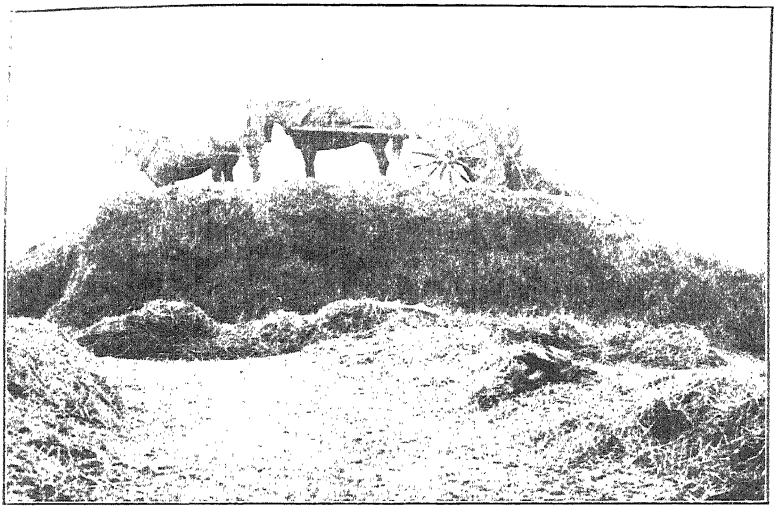


FIG. 1.—A run-over heap is made to secure consolidation.



FIG. 2.—The grass and potatoes are placed in alternate layers.

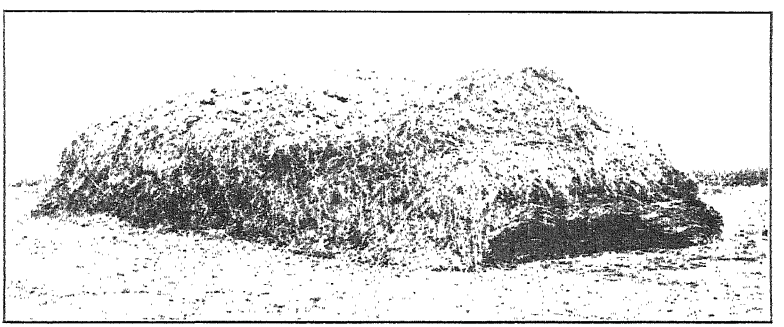


FIG. 3.—The ends are cut away and the material thrown on top, which is then covered with soil.

POTATO SILAGE.

To face page 910.



FIG. 4.—A few days later the sides are also covered with soil.

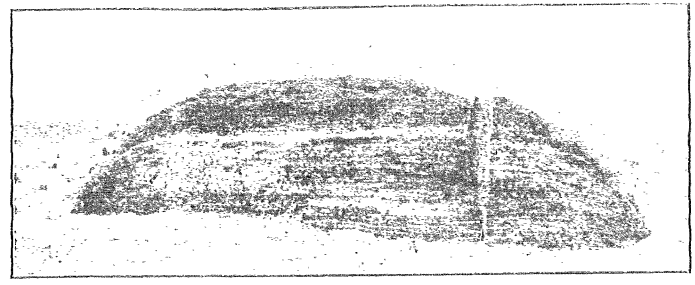


FIG. 5.—Silage made in May, 1930. Photographed May, 1931.

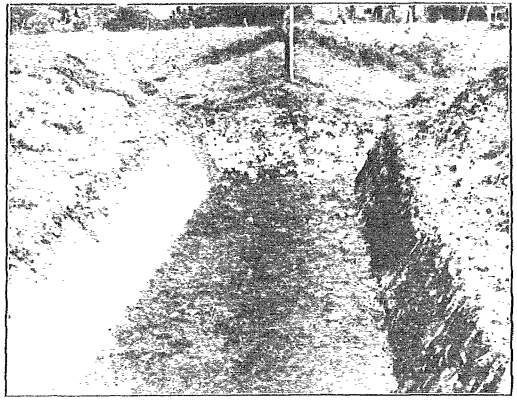


FIG. 6.—General view of a pit silo (Method 2).

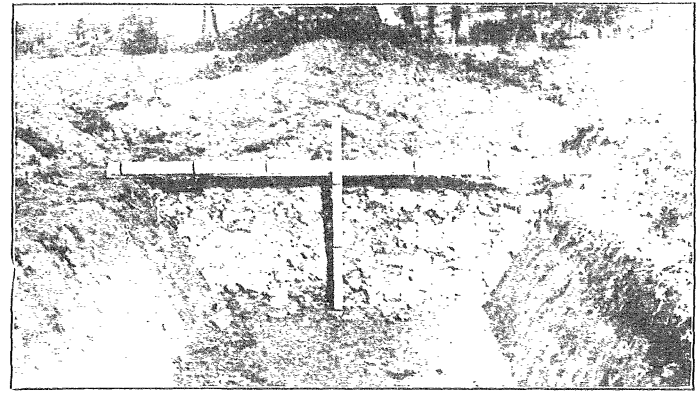


FIG. 7.—Detail of pit silo, showing dimensions (Method 2).

were white in the flesh and slightly tough. There was practically no exudation of liquid from the silo. The silage was still in condition last month (November).

Feeding Trial.—For the purpose of testing the value of the silage for feeding purposes, six Lincoln-red bullocks were selected and divided into two lots. A ration of similar balance (in so far as the nutrient qualities of the silage could be estimated) was fed to each lot. The basis of the ration in one case was potato and green fodder silage, and in the other sugar-beet pulp—the object being to test the silage against an established method of feeding.

Lot A.—Silage, 35 lb.
Maize germ meal, 3 lb.
Egyptian cotton cake, 1½ lb.
Decorticated ground-nut cake, 1 lb.
Dried sugar-beet pulp, 1 lb. (fed dry and mixed with the other concentrates).
Straw—*ad lib.*

Lot B.—Dried sugar-beet pulp, 8½ lb. (fed soaked).
Maize germ meal, 3 lb.
Egyptian cotton cake, 1½ lb.
Decorticated ground-nut cake, 1½ lb.
Straw—*ad lib.*

The dry fodder was of very poor quality—two-year-old straw from a badly-lodged crop. When calculating the ration, too much allowance was made for this fodder, and as a result the bullocks did not make proper headway in the early part of the trial. When this was recognized and the ration amended and supplemented to allow for the deficiency, the animals made good progress. As a result of this amendment, and the necessary increase consequent on the progress of the fattening period, the foregoing rations were increased during the latter part of the trial by ½ lb. Egyptian cotton cake, 2½ lb. maize germ meal, and 1½ lb. sugar-beet pulp.

No difficulty was found in using the silage; in fact, the bullocks consumed it eagerly.

The following table shows the essential average figures per bullock :—

	Initial live-weight			*Final live-weight*			*Gain per day*	*Price obtained (per cwt. live-weight)*
	c.	qr.	lb.	c.	qr.	lb.	lb.	s.
Lot A. ..	10	1	18	12	2	0	1.63	45.73
Lot B. ..	10	1	9	12	1	18	1.63	44.69

From the point of view of feeding results, the cattle could with advantage have been sold a fortnight earlier, but local market conditions made it desirable to hold them back. The beasts were all sold on the same day by auction. The silage-

fed bullocks were of better appearance, they handled better, and the skin was softer and more pliable. It will be observed from the figures that they sold better. The figures reflect the indifferent progress made during the early part of the trial.

It is of interest that both lots made equivalent live-weight gains per day, and that as the starch value and protein equivalent of the silage are the only nutrient factors unknown, these figures would appear to be approximately as follows : starch value, 17 ; protein equivalent, 1.4.

Method 2.—Potatoes Steamed and Placed in a Pit Silo.—The pit should be prepared on a convenient piece of dry ground near to the feeding pens (see Figs. 6 and 7). If water is likely to be troublesome, means should be taken to get rid of it. The pit should be made about 6 to 7 ft. wide, and about 2 ft. 3 in. to 2 ft. 6 in. deep. The sides should slope slightly inwards. The potatoes should be cooked in a steamer or copper; then transferred to the pit, into which they should be tightly packed. They should be well raised into a ridge in the middle. The sides and top of the ridge should then be covered with straw, on which should be placed about a foot of soil.

Potatoes made into silage in this way may be fed to pigs without any further preparation. The silage will keep in good condition for many months. Silage made by this method in May, 1930, was still in good condition last month (November), when it was being fed to pigs. Partly blighted potatoes, which could not be otherwise ensiled, may be preserved for stock-feeding if made into silage by this method.

Observation trials have shown that pigs readily consume this silage, and that thus fed, they do as well as pigs fed on standard balanced rations containing freshly-steamed potatoes. The silage is used in the ration in the same proportions as freshly cooked potatoes.

Method 3.—Potatoes Sliced Raw and mixed with a Portion of Maize Meal.—The steaming of potatoes adds somewhat to the cost of feeding, and for cattle it is neither necessary nor desirable. In this method, steaming is dispensed with. The potatoes are sliced in a root pulper, and are placed in a pit similar to that described under Method No. 2. At the same time a small quantity of fermented maize meal is mixed with the potatoes.

The maize meal should be prepared two days previously. It should be thoroughly saturated, but not made sloppy, and

allowed to become sour before being mixed with the potatoes. About 5 per cent. by weight of soaked maize meal is required, or approximately one cwt. per ton. Maize meal will increase in weight by about 75 per cent. when soaked. The pit should be finished off in the same manner as already described. Silage thus made was readily consumed by both cattle and pigs.

Conclusions.—The methods described above, of utilizing surplus, waste or chat potatoes, provide a satisfactory means of preserving them for future use.

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MARKETING NOTES

National Mark Eggs.—The total output of the National Mark Egg Packing Stations in October was returned as 21.5 million eggs, of which 16 million were packed under the National Mark.

During the first ten months of this year, 201 million eggs have been packed under the Mark, an increase over the figures for the corresponding period of 1930 of 46 per cent.

The classes for National Mark eggs at the Dairy Show, to which reference was made last month, attracted a fair number of entries from authorized packers. Considerable interest was displayed in this section of the Show, which undoubtedly served to bring the National Mark scheme still further to the notice of the distributive trade and the consuming public. The following were the prize-winners :—

CLASS 23

30-*doz. Non-returnable Wooden Cases containing Standard Grade Eggs.*

(1) Messrs. E. J. Parker & Sons, Maidstone, Kent. Silver Medal.
(2) Gloucestershire Marketing Society, Ltd., Cheltenham, Glos. Bronze Medal.

CLASS 24

15-*doz. Non-returnable Fibreboard Cases containing Standard Grade Eggs*

(1) Poultry Services, Ltd., Welwyn Garden City, Herts. Silver Medal.
(2) Harpenden Dairies, Ltd., Harpenden, Herts. Bronze Medal.

CLASS 25

15-*doz. Case containing Eggs of Special Grade packed in* ½-*doz. and* 1-*doz. Cartons.*

(1) Harpenden Dairies, Ltd., Harpenden, Herts. Silver Medal.
(2) Specialist Egg Farms, Ltd., Barnet, Herts. Bronze Medal.

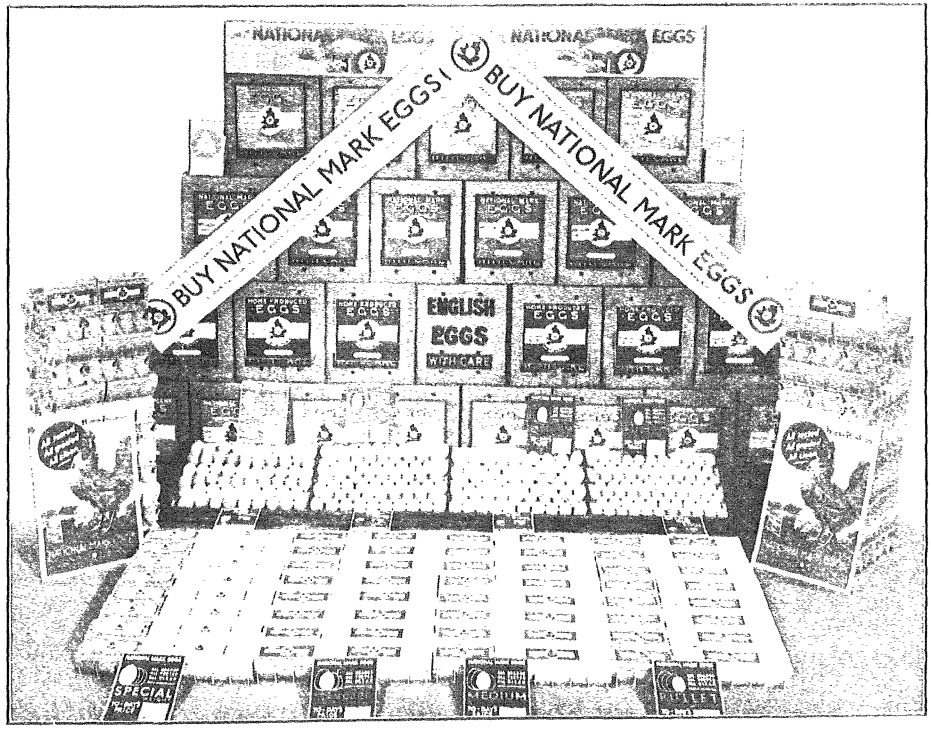
The attractive display of National Mark eggs in the Burnley Market, facing page 914, calls for recognition of the enterprise of the Burnley Model Egg Grading and Packing Station, Ltd., which, in an endeavour to bring National Mark eggs to the notice of the public, has rented a stall in the market. The venture had a successful inauguration and sales were reported to be very satisfactory.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during October, 1930, and October, 1931, and the number of sides graded and marked for the four weeks ended November 14, 1931, were as follows :—

			Number of sides
		LONDON	
Weekly average	..	October, 1930	1,925
„ „	..	„ 1931	1,788
Week ended	..	October 24, 1931	2,037
„ „	..	„ 31, 1931	2,014
„ „	..	November 7, 1931 ..	2,014
„ „	..	„ 14, 1931 ..	1,831
„ „	..	„ 21, 1931 ..	2,489
		BIRKENHEAD*	
Weekly average	..	October, 1930	729
„ „	..	„ 1931	282
Week ended	..	October 24, 1931	359
„ „		„ 31, 1931	500
„ „		November 7, 1931 ..	202
„ „		„ 14, 1931 ..	315
„ „		„ 21, 1931 ..	436
		SCOTLAND*	
Weekly average	..	October, 1930	2,178
„ „	..	„ 1931	1,133
Week ended	..	October 24, 1931	1,140
„ „	..	„ 31, 1931	1,190
„ „		November 7, 1931 ..	892
„ „		„ 14, 1931 ..	1,097
„ „		„ 21, 1931 ..	1,368
		TOTAL LONDON SUPPLIES (All sources)	
Weekly average	..	October, 1930	4,832
„ „	..	„ 1931	3,203
Week ended	..	October 24, 1931	3,536
„ „	..	„ 31, 1931	3,704
„ „	..	November 7, 1931 ..	2,965
„ „	..	„ 14, 1931 ..	3,243
„ „	..	„ 21, 1931 ..	1,369
		BIRMINGHAM	
Weekly average	..	October, 1930	364
„ „	..	„ 1931	761
Week ended	..	October 24, 1931	798
„ „	..	„ 31, 1931	834
„ „	..	November 7, 1931 ..	820
„ „	..	„ 14, 1931 ..	811
„ „	..	„ 21, 1931 ..	861
		LEEDS	
Weekly average	..	October, 1931	441
Week ended	..	October 24, 1931	506
„ „	..	„ 31, 1931	483
„ „	..	November 7, 1931 ..	489
„ „	..	„ 14, 1931 ..	480
„ „	..	„ 21, 1931 ..	307

* Sides consigned to London.

To face page 914.



Display of National Mark Eggs, in Burnley Market, by the Burnley Model Egg Grading and Packing Station, Ltd. (See p. 913.)

			Number of sides
	BRADFORD		
Weekly average	October, 1931		396
Week ended	October 24, 1931		413
„ „	„ 31, 1931		450
„ „	November 7, 1931		441
„ „	„ 14, 1931		416
„ „	„ 21, 1931		427
	HALIFAX		
Weekly average	October, 1931		103
Week ended	October 24, 1931		116
„ „	„ 31, 1931		111
„ „	November 7, 1931		123
„ „	„ 14, 1931		96
„ „	„ 21, 1931		107

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

The number of home-killed and Scotch-killed sides graded and marked for the London area showed a steady seasonal rise throughout October. Home-killed beef prices continued low, large quantities of lamb and pork being offered for sale. Normally, lamb and pork are luxury meats on account of their higher prices, but, during October, the best qualities of beef were almost the most expensive meat on the market.

There was considerable improvement in the number of marked sides consigned from Birkenhead to the London market, but fewer Canadian cattle arrived and the quality of the Canadian beef was generally of a lower standard than in earlier consignments.

The marked improvement in the Birmingham figures continues. During October, 3,371 sides were graded and marked as compared with 2,871 sides in September and 1,616 sides a year ago. Although the increase is mainly due to the fact that grading is carried out over a wider area, the returns for the Birmingham City Meat Market also show a considerable improvement. The grading and marking figures for the week ended October 31—viz., City Meat Market, 371, and total for Birmingham area, 834—are records.

The two barons of beef supplied for the Lord Mayor of London's Guildhall Banquet on November 9 were graded and marked with the National Mark.

National Mark Fruit.—To the list of authorized packers of apples have been added the following :—

Apples

Cheshire.	Cheshire School of Agriculture, Reaseheath, Nantwich.
Essex.	H. G. Evans, Pleyhill, Hatfield Peverel.
	H. Ridgwell, Mill House, Orsett.
	H. J. Russel, Lower Farm, Hatfield Peverel.
Norfolk.	Miss M. M. Cannell, Loddon.
	Col. J. B. Petre, Westwick Fruit Farm.

The total number of packers now enrolled is 121 for apples and 21 for pears.

National Mark packers have again been prominent among the prize-winners at fruit shows this autumn. At the Essex Fruit Show, held at Chelmsford in October, there were numerous entries of National Mark apples, tomatoes and cucumbers, which gained the first and second prizes in practically every class for which they were entered.

National Mark entries in various classes at the Imperial Fruit Show, held at Manchester from October 30 to November 7, were also very successful; 34 first, 30 second and 23 third prizes were awarded in the various classes open to home-grown fruit, and of these National Mark packers succeeded in gaining the remarkable totals of 31 first, 28 second and 15 third prizes. Included in these were the awards in respect of the two classes in the British Empire Section, in which National Mark packers took two firsts, one third and shared second and third prizes with a Canadian packer. In addition to these awards, the whole of the Special Awards in the Sections for which home-grown fruit could qualify were awarded, with one exception only, to National Mark packers.

National Mark Scheme for Plums.—It has long been recognized by growers that the methods of marketing home-grown plums are unsatisfactory, and growers' organizations have approached the Ministry with the object of securing for plum growers the advantages already provided for growers of apples, pears, strawberries and cherries by the National Mark Scheme. The Ministry is now taking steps to formulate a National Mark Plum scheme for discussion with the interests concerned.

National Mark Canned Fruit and Vegetables.—There is no doubt that the Canned Fruit and Vegetables Scheme has been the means of introducing the design of the National Mark into a large number of homes. Many millions of cans bearing the Mark were distributed in the 1930-31 season, and a much larger number is in course of distribution at the present time. The importance of maintaining a constant and careful watch upon the quality of so large an output, every unit of which has its effect upon the reputation of the National Mark, is a matter that has received its full share of the Ministry's attention. Now that this season's canning has ceased, various problems connected with standardization in the canned fruit and vegetables trade are under examination. Tests are being

made at the Campden Research Station to throw light on questions of flavour, appearance, keeping-quality and freedom from contamination, in order that the administration of the scheme may be kept abreast of the latest scientific knowledge. The Report of the Executive Committee of the National Food Canning Council, which held its fifth annual Convention at Manchester from November 2-4, 1931, states that fruit growers are consulting more and more with the canners as to plans for future planting. A special feature of 1931 has been the increase in the supplies of strawberries for canning, and the growing demand for clean, well-grown loganberries. Special interest has also been taken in the production of cultivated blackberries for canning. Wholesale and retail distributors report that National Mark produce continues to increase in popularity with the public.

National Mark Cider.—The following additional applicants, all of whom are manufacturers, have been authorized under the Scheme :—

J. B. Chevallier, Aspall Hall, near Debenham, Suffolk.
Richard Jackson, Horsecombe, Salcombe, S. Devon.
H. R. D. Coles, Fordwater Farm, Axminster, Devon.
H. C. J. Horrell, Bridge Farm, Stoke Cannon, near Exeter.

The total number of authorized packers is now 64, consisting of 39 manufacturers and farm cider-makers, 2 associations of farm cider-makers and 23 bottlers ; three further applications for enrolment are under consideration.

The English cider-apple crop this year is poor, being estimated to amount to scarcely more than a quarter of that of last year, and makers are experiencing difficulty in obtaining English apples. The need for increased planting and renovation of cider-apple orchards is apparent. Sales of National Mark cider have been satisfactory.

National Mark Wheat Flour.—The following firms have recently been enrolled as authorized packers :—

Chard Bros., 6 Palace Avenue, Paignton (and branches).
R. G. Gifford, 118 High Street, Winchester.
D. E. Stannard, Bedford Street, Norwich.

Permission has been given to a number of authorized repackers to incorporate the National Mark design in the printed design on their paper or cotton bags. Where National Mark flour is packed in bags bearing designs approved by the Ministry, the usual red, yellow and blue official adhesive labels are not used.

Marketing Demonstrations.—Demonstrations of improved

methods of marketing were staged by the Ministry during November as follows :—

Show	*Place*	*Period*	*Demonstration*
Imperial Fruit Show	Manchester	Oct. 30-Nov. 7	Fruit, Canned Fruit, Cider and Honey.
Brewers' Exhibition	Agricultural Hall, London	Oct. 31-Nov. 6	Cider.
Norwich Fatstock Show	Norwich	Nov. 19-21	Organization of Potato Marketing.*

* See also note on page 920.

Displays of National Mark and Other Home Produce.—The England and Wales Stand (for which the Ministry, in conjunction with the National Farmers' Union, was responsible) occupied the most prominent position in the Empire Marketing Board display at the Imperial Fruit Show, Manchester, October 30 to November 7. The main feature of the stand was a comprehensive display of English apples and pears, graded and packed to National Mark standards, supplemented by canned fruits and vegetables, bottled fruits, jam, honey, cider, and tomatoes, cucumbers and other glasshouse produce.

The Empire Marketing Board has acquired a temporary lease of shop premises at 27-29 Lord Street, Liverpool, for the purpose of giving fortnightly displays of the produce of the various countries of the Empire. England and Wales were allotted the opening fortnight from November 16, on which date the Earl of Derby performed the opening ceremony before a representative gathering presided over by the Lord Mayor of Liverpool, supported by the Mayor of Birkenhead. The Minister of Agriculture was represented by his Parliamentary Private Secretary, Major A. J. Muirhead, M.C., M.P., who accepted the tenancy of the shop on behalf of the Ministry. In the course of his remarks, Lord Derby laid special stress on the present urgent need of making every effort to increase the home production of foodstuffs and thus reduce our expenditure abroad.

As in the case of previous similar shops in Glasgow, Birmingham and Blackpool, the responsibility for the "England and Wales" fortnight was undertaken by the Ministry in conjunction with the National Farmers' Union. A representative display of home-produced foodstuffs was staged, small samples being sold.

Publicity for National Mark Produce.—On Monday, November 16, the Empire Marketing Board inaugurated an intensive "Buy British" campaign on behalf of home and other Empire products. The Board has always emphasized in its propaganda that "Empire buying begins at home," and in this new campaign special prominence is being given to home

produce in general and National Mark produce in particular. The Ministry co-operated with the Board by bringing the campaign to general notice in the rural areas, and in the early part of November issued several thousand circular letters to branches of the National Farmers' Union, poultry societies, hotel and restaurant proprietors, surveyors and land agents, Lord Mayors and Mayors of cities and towns in which National Mark Weeks have been held, etc. Authorized packers under National Mark schemes were circularized in the following terms :—

SIR (or GENTLEMEN),

"BUY BRITISH" CAMPAIGN

I am directed to inform you that on Monday, November 16, the Empire Marketing Board will inaugurate a "Buy British" campaign, a preliminary announcement of which is contained in the enclosed notice dated October 26, 1931.

At the present time, when so much public attention is being directed to the need for giving preference to home produce in order to assist in rectifying our adverse trade balance, the National Mark is of special importance as a ready and indisputable guarantee of home origin. The "Buy British" campaign provides an exceptional opportunity to extend both the production and the sale of National Mark commodities, and the Ministry hopes that authorized packers will turn the campaign to good account in any way that may be open to them.

It will be observed from the notice that included in the items of publicity is the provision, for individual display, of large quantities of two special posters, in crown and double crown size, supplies of which will be obtainable *on personal application* at any Local Employment Office of the Ministry of Labour. Miniatures of these two posters are enclosed. Every Post Office has a notice showing the address of the nearest Local Employment Office. The Ministry suggests that authorized packers who have facilities for the purpose should obtain and display these posters on their vans and on their premises, particularly if their premises abut on to a main road.

It is hoped that on the morning of Monday, November 16, there will be a striking display of the posters throughout the country. Every effort is being made to encourage traders to afford practical expression to the movement by making special displays of home and other Empire produce, especially in the week commencing November 16. The Ministry hopes that authorized packers whose products are in season will do everything possible to induce their retail customers to give special prominence to National Mark products in their displays and to make liberal use of National Mark display cards and posters in addition to the special "Buy British" posters.

I am, Sir (or Gentlemen),

Your obedient Servant,

A. W. STREET.

From time to time, many of the large London stores arrange special displays of National Mark products, either separately or as part of a general Empire display. Following such displays by Messrs. Harrods and Messrs. Selfridge in October, the Civil

Service Supply Association, Ltd., arranged a special show of Empire produce, including National Mark produce, in the first week of November.

Sir Charles Howell Thomas, K.C.B., C.M.G., the Permanent Secretary to the Ministry, made a strong appeal, at the Livery Banquet of the Worshipful Company of Gardeners held on November 4 at Fishmongers' Hall, especially to the Merchant members of the Company, for whole-hearted support of the National Mark for British agricultural produce. Mr. Gordon Selfridge, in responding, not only endorsed the value and significance of the Mark as a means of identifying high-quality goods of British origin, but added that in these days of adverse trade balances it was of vital importance to the country for the Mark to be supported by the commercial community. Mr. Selfridge emphasized that he himself was prepared to place the whole of his important distributive organization, whenever possible, at the disposal of the Ministry for this purpose, and said he was confident that other important retail stores would, in the national interest, support the movement.

The Ministry's programme of Press advertising of National Mark products was continued during November. National Mark beef was advertised in the Birmingham, Leeds and Bradford newspapers and in the *Meat Trades Journal*; eggs in certain journals circulating to producers; flour, malt extract with cod-liver oil, canned fruits and canned vegetables in the trade Press. National Mark canned fruits were also advertised in women's journals, and in a special Canning Supplement published by *The Times* on November 17, this including a personal message from the Minister of Agriculture and a striking article by Sir Stanley Machin, Chairman of the National Mark Canned Fruit and Vegetables Trade Committee. A special canning page of the *Daily Telegraph* of November 11 contained an informative article which made special reference to the value of the National Mark.

The Organization of Potato Marketing.—During the month, the Ministry has published a *Report on the Organization of Potato Marketing*,* to which particular significance attaches. Up to now, the commodity reports issued in the Economic Series have focussed attention on the problems of standardization, which are generally admitted to be fundamental to all marketing reform. The subject of this latest Report, as its title indicates, is not standardization but organization, and it

* Economic Series No. 34. This Report is complementary to the *Report on the Marketing of Potatoes* (Economic Series No. 9). Price of each 6*d*. net, post free 9*d*., obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

is intended that organization shall be the subject of a series of commodity reports just as standardization has been. The purpose of this report is to survey the existing organization at home, to collate and disseminate information on attempts at introducing organization in potato marketing in other countries, and to suggest the foundations on which the improvement of marketing methods in this country must rest and some possible and alternative methods by which those foundations might be laid.

The first part of the report is concerned with present-day conditions in this country, significant chapters being those devoted to weaknesses of the existing system and recent constructive developments initiated or discussed by the industry.

The second part is descriptive of organization overseas, North America and Europe having both proved particularly rich in examples of enterprise of widely differing kinds. In Part III, this overseas experience is analysed from the aspects both of the structure of the organizations themselves and of the functions undertaken by them.

In Part IV, the surplus problem is reached. The facts emerge that, although in a number of countries, and particularly on the Continent, alternative outlets for potatoes have been assiduously fostered, yet none of these outlets adequately fills the rôle of a surplus outlet, and that when alternative outlets exist they seem merely to accentuate the surplus problem. By no country has any organized effort been made to solve the problem of recurrent potato surpluses. In the final part of the Report, chapters are devoted to the fundamental tasks that must precede any serious effort to introduce organization into the marketing of the home crop; these tasks include the introduction of standard grades and packages, an agreed code of trade practices, an adequate service of market intelligence, and a better and organized system of credit. Finally, the report suggests how organization built on these foundations might reduce the day-to-day price fluctuations and the recurrent seasonal price-collapses which do the industry such untold harm.

In the 175 pages of the report, there are collected facts with which many agriculturists will be unfamiliar; if for this reason alone, it is a serious contribution to the discussions on "what might be" that have been in increasing evidence in this country during the past few years.

A report of this character, based on a critical survey of world experience in commodity marketing organization, is of

obvious value to producers in other parts of the Empire. Accordingly, the Empire Marketing Board has asked for 1,000 copies of the Ministry's report for distribution overseas.

Demonstration of the Organization of Potato Marketing.—As already stated, the Ministry's exhibit at the Norwich Fat Stock Show included a demonstration of the organization of potato marketing. This demonstration, which summarizes, in poster and diagram, the main sections of the report discussed above, was staged for the first time at the Lincs (Holland) County Potato Show on October 29, and attracted much attention.

Sugar-Beet Production, 1931–32.—According to returns made by the beet-sugar factories operating in Great Britain, the total quantities of beet sugar manufactured during October, 1931, and the corresponding month in 1930 were :—

	Cwt.
October, 1931	1,274,070
October, 1930	2,110,605

The total quantities of sugar produced during the two manufacturing seasons to the end of October were :—

	Cwt.
1931-2	1,274,070
1930-1*	2,309,180

* Includes September output ; in 1931-32, the manufacturing season did not commence until October.

The following averages have been compiled from data supplied to the Ministry in respect of beets delivered to the beet sugar factories in England and Wales during the current manufacturing season up to and including the week ended November 14. Averages for the corresponding period of the previous season are shown for comparison.

Week ended	*Average weight of roots (grammes)*		*Average sugar content (per cent.)*		*Average weight of sugar per root (grammes)*	
	1931	1930	1931	1930	1931	1930
September 26 ..	—	514	—	15·6	—	80
October 3 ..	—	507	—	15·7	—	80
,, 10 ..	*	516	*	16·0	*	83
,, 17 ..	410	498	17·6	16·8	72	84
,, 24 ..	399	501	17·8	17·3	71	87
,, 31 ..	393	509	17·8	17·5	70	89
November 7 ..	397	505	17·7	17·4	70	88
,, 14 ..	388	516	17·5	17·4	68	90
Season to date ..	395	507	17·7	17·0	70	86

* The small deliveries made in this week are included in the averages for the following week.

Rates of Advances under the British Sugar Industry (Assistance) Act, 1931.—Below are given the average prices of raw cane sugar certified by the Minister for the periods specified and

the corresponding rates of advances under the above Act per cwt. of beet sugar of a polarization exceeding 98 degrees :—

Certified average price per cwt. of raw cane sugar			*Rate of advance per cwt. of ex. 98° beet sugar*		
Fortnight ended	*s.*	*d.*	*Week of manufacture*	*s.*	*d.*
October 31, 1931 ..	6	7	November 7, 1931 ..	1	2
November 7, 1931 ..	6	5½	„ 14, 1931 ..	1	3
„ 14, 1931 ..	6	5½	„ 21, 1931 ..	1	3
„ 21, 1931 ..	6	5½	„ 28, 1931 ..	1	3

Modern Tendencies in Distribution.—The joint Report of the Europe/U.S.A. Committee of the International Chamber of Commerce and the International Management Institute on "Distribution in the United States and Europe" draws certain conclusions as to the trend of distributive methods that directly concern the producer of agricultural commodities. It is shown that for all classes of goods "there is clearly evident a decided trend in the direction of large-scale marketing." This trend is being assisted by, *inter alia*, the standardization of quality and packages that is "bringing more and more classes of goods into the category of staples, thus lessening the necessity of personal selection and inspection before purchase and the amount of sales work required, and permitting of mail and telephone buying by consumers." This trend toward large-scale operation is, in Europe, developing along two lines—capitalist integration and consumers' co-operation. The effect of the trend is that the individual retailer's shop, and with it the individual wholesaler whose function was to supply the small-scale retailer, is in many trades being replaced by the chain store that aims at buying most of its goods direct from the producer or manufacturer.

The bearing of this trend on the agricultural producer in this country is obvious. His main market at present is just the individual wholesaler or retailer class that the times are tending to displace. The large-scale distributing firm mainly buys where it can secure large bulks of standardized goods. Hence, to the extent that home agricultural products are marketed in small individual lots without regard to standard quality grades or packages, the result must be a gradual loss of market to the imported product which better satisfies the requirements of the trade.

Germany : Developments in the Standardization and Sale of Peas.—An interesting attempt by producers and distributors jointly to improve the marketing of peas in Germany is described by Dr. Alexander Mann of the Chamber of Agricul-

ture for the Province of Saxony in the July issue of the *Blätter für landwirtschaftliche Marktforschung.**

In 1930, the Middle-German Pea Association (Mitteldeutsche Erbsenverband) was formed as a limited liability company by six firms of distributors together with the pea growers of Middle Germany, for the purpose of marketing the Middle-German output of Victoria peas. The produce firms concerned contracted to put at the disposal of the Association the whole of their pea storage-space and sorting and cleaning plant, as well as their entire sales machinery, and to cease all individual dealings in peas.

The majority of the growers of peas in Middle Germany joined the Association. The grower contracts to hand over, for disposal by the Association, his entire crop of peas with the exception of his own requirements for home consumption and seed. In the first place, five-year contracts were made, but, when a sufficient nucleus of members had been obtained on this basis, growers were signed on with one-year contracts. The contract system prevents producers from selling their peas in competition with the Association. As the Association thus controls most of the output of Middle Germany, and as the bulk of the German production of Victoria peas is concentrated in that area, there appears to be every likelihood that the Association will be able to exercise an important influence on the market.

The grower delivers his produce at his own time to one of the storage and cleaning depots that have been placed at the disposal of the Association by the affiliated firms. These depots are distributed throughout the producing area; transport costs are thus saved and disposal is facilitated. The Association's depots are adequate for the handling of the crop, offering storage space for from 50 to 60 per cent. of the Middle German pea crop. An advance payment is made to the grower on produce delivered by him, at the rate of from 60 to 70 per cent. of the market price on the day of delivery. Further instalments are paid from time to time according to the position of the Association. These payments are financed through an association of large banks, the title to the warehoused stocks being transferred to the banks as security. A final instalment is paid at the end of the business year on the basis of the amounts realized on the sale of the peas minus a deduction for operating costs.

* The monthly journal of the Institute for Research in Agricultural Marketing, Berlin.

One of the chief improvements that the Association has effected is the enforcement of strict standards of sorting and preparation for market. With the co-operation of the Chamber of Agriculture for the Province of Saxony, three grades have been set up for Victoria peas, based on colour and size, with a maximum allowance for damaged, discoloured and undersized peas. The following are the definitions of the grades :—

I. *Saale Extra Giants*
1. Colour : yellow to yellow-rose.
2. Size : from 7·25 to 7 mm. riddle.
3. Proportion of damaged peas : 1·5 per cent. permissible.
4. Proportion of discoloured peas : 0·5 per cent. permissible.
5. Proportion of smaller-sized peas : 3 per cent. permissible.

II. *Saale Giants*
1. Colour : yellow to yellow-rose.
2. Size : from 7 to 6·25 mm. riddle.
3. Proportion of damaged peas : 2 per cent. permissible.
4. Proportion of discoloured peas : 1 per cent. permissible.
5. Proportion of smaller-sized peas : 3 per cent. permissible.

III. *Saale Consumers*
1. Colour : yellow to yellow-rose.
2. Size : from 6·25 to 5·75 mm. riddle.
3. Proportion of damaged peas : 2 per cent. permissible.
4. Proportion of discoloured peas : 2·5 per cent. permissible.
5. Proportion of smaller-sized peas : 3 per cent. permissible.

After delivery by the grower to the Association's depots, the peas are sorted into the above grades and the final payment to the producer is based upon the grade reached by his produce. A grade-price pool is thus operated.

The grades are used by the Association as a basis of sale, though they are not yet covered by a Mark. With the beginning of the 1931 harvest, however, the Chamber of Agriculture proposed to authorize the Association to use its Control Mark for peas of these grades and thus to give the consumer a guarantee that the produce is actually up to the grade standards. The grading will then be carried out under the supervision of the Chamber of Agriculture.

Although an innovation, the use of these grades has given satisfaction to the trade, consumers and producers alike.

U.S.A. : Two Years' Progress under the Agricultural Marketing Act.—The following excerpt is from an address given by the Chairman of the Federal Farm Board, before the Annual Convention of the American Bankers' Association, at Atlantic City, New Jersey, on October 7, 1931.

"Its severest critics, I think, will have to admit that the past two years have been rather difficult ones in which to demonstrate the effectiveness of the Agricultural Marketing

Act to achieve the purposes for which it was passed. And yet real progress has been made in strengthening the co-operative marketing associations which were already functioning, and assisting in the organization of others. As evidence of this fact, cotton co-operatives handled twice as much cotton in 1930 as they did in 1929; wool co-operatives, almost five times their 1929 receipts; grain in terminal markets three times the amount they had previously handled; and there was no co-operative to my knowledge which did not show an increase in the 1930 crop over 1929.

"And as further evidence, during these trying times the Board has given financial assistance of more than $300,000,000 —aside from loans from the wheat and cotton stabilization operations—to 112 co-operative associations, many national or regional in scope with hundreds of local co-operative associations as members. Of the money borrowed from the revolving fund, these co-operatives have paid back nearly $170,000,000, and up to the present time only two co-operatives have failed, both of which were comparatively small organizations."

Empire Wool Conference.—As a result of a resolution, passed at the Thirteenth Annual Conference of the Graziers' Association of New South Wales, that steps be taken to co-operate with other parts of the Empire in the offering of future wool clips, an Empire Wool Conference was held at Melbourne from June 22–24, 1931. Representatives of wool growers and wool brokers from Australia, New Zealand and South Africa, as well as of the Australian banks, attended.

The Conference was largely concerned with the immediate marketing problems of the wool producer, including the classing and preparation of clips, wool packs, lot splitting, estimates of the clip and publication of prices. It dealt, however, with the wider problem of method of sale and a resolution strongly favouring the system of public auction was passed, from which only the South African brokers dissented. The Conference firmly opposed any attempt at price fixation by the producer which ignored the laws of supply and demand, but favoured attempts at stabilization by the regulation of offerings and by co-operation between wool-producing countries, and hoped that Argentina and Uruguay would fall in with the policy of co-operation.

* * * * * *

THE SOMERSET EGG AND POULTRY COMPANY, LIMITED

(NATIONAL MARK EGG AND POULTRY PACKERS.)

THE Somerset Egg and Poultry Company, Ltd., commenced business at Taunton on October 1, 1930, as packers of National Mark poultry and eggs. The company is operated in conjunction with an established cold-storage business, though as an independent concern, and the premises of the two firms are contiguous. This has certain advantages from the point of view of both businesses. In the flush season for eggs, large quantities can be put into cold-store for sale in the autumn and winter, though they cannot then be sold under the National Mark. The advantages of cold-storage facilities to a firm operating a poultry-packing plant are obvious. As is pointed out below, economies can also be effected in the sharing of road transport expenses.

The combination of poultry with egg packing also has advantages. The sources of supply of both products to some extent overlap, and collection costs can be reduced in consequence. Moreover, labour can be diverted from one activity to the other according to the pressure of work. This is a very real advantage as regards poultry and eggs, for the slack period for one commodity coincides with the busy time for the other.

Supplies.—While most of the supplies, both of poultry and eggs, are obtained within a radius of 30 miles of Taunton, the area of supply of poultry extends as far west as Cornwall and as far east as Devizes, while eggs are obtained from as far as Dorchester—38 miles. Numerous methods of obtaining supplies are adopted. The firm employs two motor-lorries continuously in collecting eggs and poultry direct from the farms or from local markets. It is only in the spring, however, that the markets are largely used as a source of supply of eggs; market purchases do not amount to more than 25 per cent. of the total after May. Poultry are also obtained from agents who buy in markets further afield and frequently relieve the station of old hens, which are unsuitable for the firm's trade. A fair proportion of the egg supplies is also obtained from small collectors who receive 1*d.* per dozen commission. The majority of eggs are still bought at a flat rate and are paid for in cash, but small quantities are bought by the lb. and a start has been made in some instances in paying by grade at National Mark Egg Central prices minus 12½ per cent.; payment is then made by

cheque weekly. The last-mentioned method of payment—*i.e.*, on a service basis—is regarded as the most satisfactory method to both parties, but is new to producers in this area, few of whom are yet willing to change over from the long-established method of cash payment at a flat rate.

The question of suitable supplies is one of the firm's most difficult problems. With regard to poultry, the difficulty is to secure birds of the required type, and much is being done in an endeavour to educate producers in this respect. With eggs, the main difficulty is the intensity of competition for supplies in the neighbourhood. Taunton is situated within a comparatively short distance of coastal resorts on both the Bristol and English Channels, and the competition from dealers supplying these towns, as well as from buyers for local consumption, tends to force up prices in the local auctions to a level higher than the packer who is sending eggs in bulk to distant cities can afford to pay. Like other National Mark packers in "exporting areas" throughout the country, this firm is in fact helping to bear the burden of surplus disposal, to the benefit of those traders who supply local demand. This is not generally appreciated by producers, who, especially in the scarce season, are apt to take the short view of simply comparing local market prices with those paid by the Company. The Company has not been operating long enough to be able to arrange contracts with egg suppliers.

Equipment and Working.—The Company's premises, in addition to offices, consist of a poultry feeding-house, a plucking and grading room, and an egg-packing room. A striking feature of the establishment is the loading bank (Fig. 1), which enables produce to be loaded in and out with the minimum of labour.

(*a*) *Poultry Plant.*—One of the principal functions performed by a National Mark poultry-packing station is that of putting a final finish on the birds and so giving them a much increased value per lb. Very little of the poultry produced on farms in this country is really in table condition when marketed. The possession of a minimum of crating capacity to enable this "conditioning" to be carried out is, therefore, one of the essential qualifications of an authorized packer under the National Mark.

All poultry are received alive and are subjected to about a fortnight's intensive feeding before killing, in order to give them the required finish.

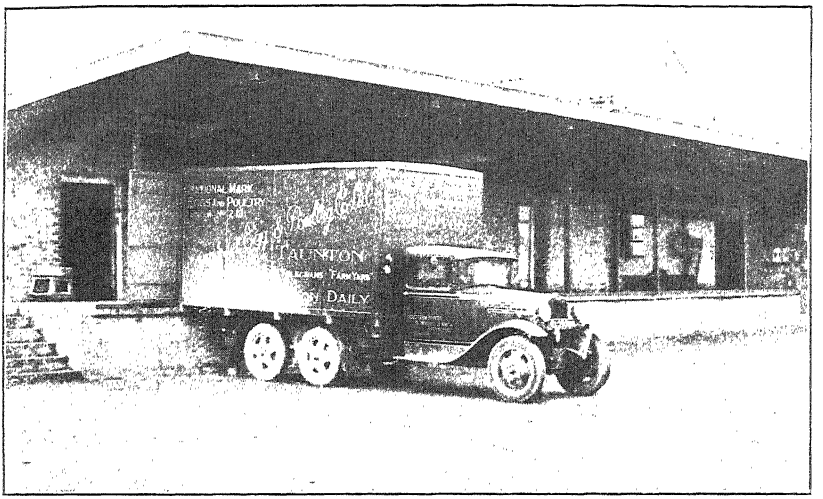


FIG. 1.—The loading bank.

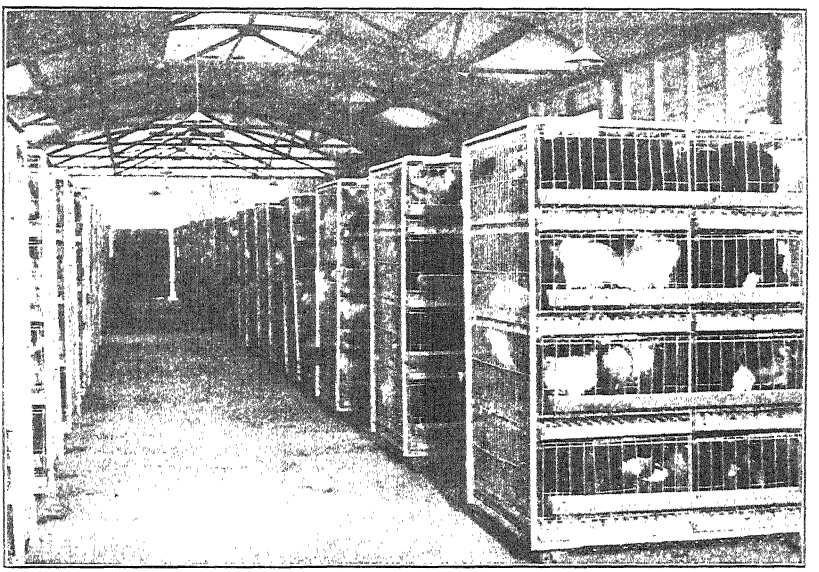


FIG. 2.—View of the poultry-feeding house.

THE SOMERSET EGG AND POULTRY CO., LTD.

To face page 928.

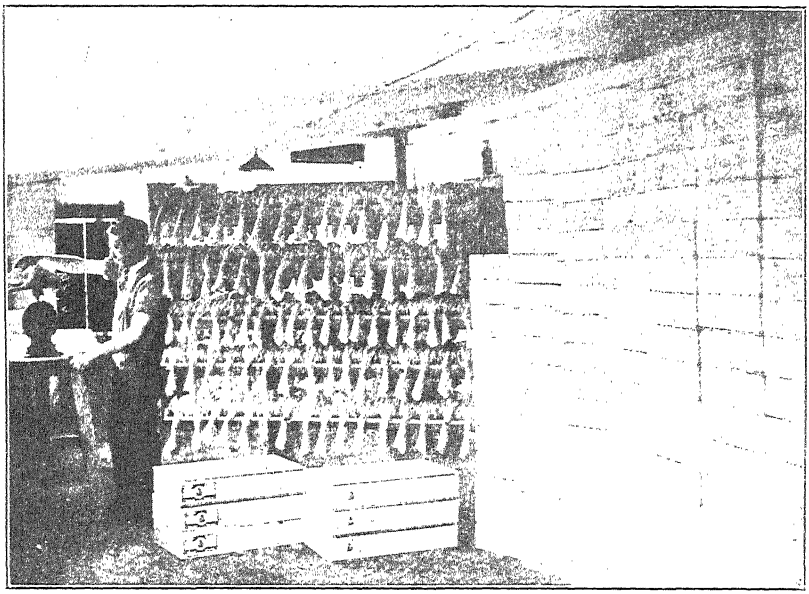


FIG. 3.—Poultry in process of cooling, shaping and grading.



FIG. 4.—The egg-grading room.

Both chickens and ducklings are handled. The feeding of chickens is carried out on what may fitly be termed mass-production lines. The birds are penned in what are known as "batteries." These batteries (Fig. 2) are four-tiered sets of wire cages, in double rows, fitted with external feeding-troughs, and each battery holds 80 or 96 birds according to the size of the birds. The birds are penned close so as to avoid all unnecessary movement and are trough-fed with a mixture of Sussex ground oats and skim-milk, ample supplies of the latter being obtainable from a local creamery. The poultry-feeding house accommodates 56 batteries—*i.e.*, from 4,500 to 5,200 birds. The whole of the feeding and attention are carried out by a man and two boys.

As a result of this conditioning process the birds not only gain weight to the extent of from 15 to 20 per cent., but their quality and consequent value per lb. are greatly improved.

Killing, plucking and dressing are carried out in a separate building. All birds are bled immediately on killing. Hand-plucking is the sole method employed. Seven men are employed for this work, of whom four are highly-skilled. Working at full pressure, one man can deal with 120 birds per day.

Immediately after dressing, birds are placed breast downwards in rows in wooden shaping-troughs to cool and "shape." (Fig. 3.) They are then graded by weight and quality in accordance with National Mark standards, and, after the appropriate National Mark discs have been attached, are packed in dozens into shallow, wooden, non-returnable boxes, bearing the National Mark label and the company's trade mark—"Tone Brand"—as well as the net-weight of contents.

During the first year of operation, the output of poultry amounted to 55,000 head. With the same staff and equipment, double this quantity could be handled, and as the turnover expands, reduced costs are anticipated.

(*b*) *Egg Plant.*—The room used for egg-grading is one of the cold-rooms belonging to the cold-storage company, and, though it is no longer artificially cooled, a low temperature can be maintained all the year round. One grading-machine —a "B.M.R."—is used, and six girls—four candlers and two packers—are normally employed to operate the machine and to pack the eggs. (Fig. 4.) In the flush season, however, when few poultry are coming forward, the poultry-dressing staff are transferred temporarily to the egg-room. A large proportion of the eggs at this season are put into cold-store; they are candled, graded for size over a Baker grader and

stamped "English chilled" before storing. Only eggs of *Standard* grade were stored last season. On removal from store, they are re-candled before being packed into 30-doz. wooden cases. Chilled eggs are not eligible for sale under the National Mark. This arrangement provides the egg-grading staff with work when few fresh eggs are available, and enables permanent skilled candlers to be kept on throughout the year. One of the problems of many egg-packing stations is that as candlers often have to be dismissed in the slack season, it is difficult to obtain skilled workers readily.

Fresh eggs are packed into fibreboard non-returnable containers with pulp-board cup flats throughout, and wood-wool pads at the top and bottom. The total cost of a 15-doz. container and fittings is 9*d*. The use of cup flats involves a cost of 1*d*. per package, but this is regarded by the manager as being easily covered by the saving of breakages. The saving of one egg breakage per box is sufficient to pay the extra cost.

In the eight months from February, 1931, when egg packing commenced, to September 30, 1931, about 4¼ million eggs were handled, the maximum monthly quantity having been one million—in May.

Disposal.—The firm's output of poultry is marketed in various parts of the country. A large proportion goes to London, and some as far north as Manchester. About 85 per cent. of the egg output is sent to London wholesalers, the remainder to various south-coast towns. All deliveries of eggs and poultry to London are made by road, by the firm's own six-wheeled lorry (Fig. 1), which will take 360 15-doz. cases of eggs. The lorry makes two journeys per week at a very low cost, since return loads can frequently be obtained. Even if no allowance is made for the return load, however, the cost of delivery of eggs is less than 3*d*. per 120.

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NOTES ON PRICES AND SUPPLIES*

R. J. THOMPSON, C.B., O.B.E.

THE feature of the past month has been the continued rise in the price of wheat, owing mainly to the suspension of offers from Russia, which, combined with unfavourable crop reports, led to great firmness on the Chicago and other world markets. The whole of the gains made early in November were not maintained, and in the middle of the month the tendency was decidedly weak. British wheat of average quality has risen since harvest by about 10*s.* per 504 lb. Maize has also risen, and feeding stuffs generally were dearer on the month by 10 to 25 per cent. Eggs have shown a seasonal increase, while potatoes are fetching good prices following the poor crop. Improved industrial conditions in the wool trade have led to a better demand for home-grown wool. Against these upward movements in price must be put a further decline in cattle and sheep, while pigs, though a turn better for a week or two, have been practically stationary.

Rates of exchange with countries remaining on the gold standard have shown no material change as compared with a month ago, the pound sterling being generally at a discount of about 22 per cent. The exchange with Argentina has, however, risen, and the Argentine paper dollar, which in September cost 1*s.* 1*d.*, was in the middle of November worth about 1*s.* 5½*d.*, an increase of 13½ per cent. This figure is still much below par, and is approximately the same as in April last, but it makes purchases from Argentina more costly in English money than they were two months ago. With the Scandinavian countries, the discount on the pound was about 2½ per cent., so that imports of bacon, eggs and dairy produce from these countries are but little affected. The rate of exchange with Australia and New Zealand remained practically unaltered.

A point that needs to be borne in mind in considering the advantage that British agriculturists are likely to obtain from the abandonment of the gold standard is that the benefit will not only vary according to the rate of exchange but also according to the extent of the competition between different countries to sell on the British market. If all countries other than Great Britain were on the gold standard, a uniform increase of 20 per cent. might be expected in the cost of

* Written mid-November.

imports, but as this is not the case competition to sell in the British market has the effect of forcing some countries to accept lower prices in order to enable them to compete with the country most favourably situated from an exchange point of view. The cost of exchange—that is, of transferring money from one country to another—is, in fact, part of the expense of putting goods on the market in this country, like freight, insurance and other charges, and the extent to which it enters into the ultimate cost depends on competition. For example, if by reason of the exchange it is cheaper to buy wheat in Argentina or Canada than in the United States, then in order to sell it becomes necessary for the United States to accept corresponding rates, or by abstaining from selling to induce higher prices owing to shortage of supplies. In either event, and in practice, they both operate together, and the effect of the exchange becomes merged in the adjusted price.

The changes that have taken place in the past month in the prices of some of the principal home and imported products can be seen from the following table :—

	November, 1931	*October*, 1931	*November*, 1930
	s. d.	*s. d.*	*s. d.*
Wheat, *Gazette* average, per cwt. ..	6 10	5 4	6 10
,, No. 2 Manitoba, ,, ,, ..	7 7	6 3	6 10
,, Argentine ,, ,, ..	7 0	5 4	6 8
,, Russian ,, ,, ..	7 0	5 2	5 11
Fat cattle, first quality, per cwt. ..	43 0	44 6	48 6
Beef, English N.M. Prime, per lb. ..	0 6½	0 7	0 7¾
,, Argentine Chilled H.Q., per lb. ..	0 6⅜	0 7½	0 7¾
Fat sheep, first quality, per lb.	0 9¾	0 10½	1 1¼
Mutton, English, per lb.	0 8⅛	0 9⅜	0 11⅝
Lamb, New Zealand, per lb.	0 7⅞	0 8¾	0 9
Bacon pigs, first quality, per score ..	9 10	10 0	14 0
,, Danish green, per cwt.	60 0	70 0	80 0
Pork pigs, first quality, per score ..	12 2	12 4	17 10
,, English, per lb.	0 8¼	0 8¾	1 0¼
Butter, New Zealand, per cwt.	124 0	128 0	120 0
Cheese, Dairy Cheddar, per cwt... ..	92 0	88 0	98 0
,, New Zealand ,, ,, ...	71 6	72 6	77 0
,, Canadian ,, ,, ...	73 0	73 0	81 6
Eggs, N.M. Standard, per 120	25 3	20 9	25 9
,, Dutch, 18 lb. ,, ,, ...	21 6	16 3	24 0
Potatoes, King Edward, Lincs and Yorks, per ton	185 0	160 0	130 0
Wool, Southdown, per lb. at Bradford ..	1 1	1 0½	1 2
Maize, Argentine, per cwt.	5 3	4 2	4 7

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending November 11, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

Wheat.—Wheat prices have fluctuated a good deal during the month, though on the whole the upward tendency has been maintained. The Liverpool December future stood at 5*s.* 6*d.* per 100 lb. on November 14, as compared with 4*s.* 9*d.* a month earlier, and 3*s.* 11⅞*d.* on September 15, the highest point touched being 6*s.* 1½*d.* on November 5. Some small fluctuations were due to variations in sterling, but in the main the effect of the alteration in the value of money was seen a month ago, and the subsequent rise was due to the stoppage of fresh offers of wheat from Russia and to reports of unfavourable weather in Argentina and of drought in the United States and Canada. Domestic prices improved in all these countries, but, in the middle of November, rates had fallen appreciably from the level reached earlier in the month.

The absence of competition from Russia undoubtedly affected the market quite substantially, and to an extent out of proportion to the prospective loss of supply. Russia was only expected to export from 12 to 15 million quarters this season, and of this quantity over 7 million quarters had already been shipped by the middle of November, leaving only 5 to 8 million quarters to be shipped up to the end of July next. Even if no further shipments are made, a deficiency of this amount can have little permanent influence on world prices in view of the large stocks remaining in the United States and Canada, though the immediate effect is to make the world rather more dependent on supplies from North America in the next month or two. At the time of writing, the position as regards further supplies from Russia is quite uncertain.

A good deal of wheat still remains in Argentina, and conditions for the new crop appear to be reasonably favourable. The area sown is less than last year, but the total production may prove fully up to the average. In Australia, the position is much the same: a preliminary estimate puts the yield at 177 million bushels as compared with 212 million bushels in 1930, which, however, was an exceptional crop. This would still be above the average and would compare with the good crop of 1928. There appear, therefore, to be prospects of ample supplies from these two sources in the new year.

Imports into the United Kingdom in September and October were very large, the total for these two months amounting to 7,175,000 quarters as against 4,898,000 quarters in the same period last year. Port stocks again showed a heavy increase and were higher than they have been for many years.

During the past three seasons the world has been burdened with excessive supplies of wheat, unsold stocks being carried over (mainly in North America) from one year to another, with a resultant progressive depression in prices. This year (1931-32) the position has so far changed that there is a reasonable prospect of these stocks being reduced to more manageable proportions. The extent of the reduction is, of course, dependent on many factors that cannot be foreseen, but with smaller crops in Canada, Argentina, Australia and Russia, it is evident that the accumulated stocks will be drawn upon and not further increased as they were last year. A careful review of the apparent supply and demand, as compared with past years, has recently been made by the International Institute of Agriculture, and is summarized in the following table. The figures for the current season are advance estimates based on such information as was available towards the end of October, and are only provisional. The estimate of the quantities available for export, for example, is necessarily uncertain as the out-turn of the Argentine and Australian new crops is not yet known, while the amount of the exports from Russia can, in present circumstances, be no more than guessed. The calculation, as a whole, however, is of value as giving an approximate view of the situation.

	Quantities available mill. bushels	Requirements of importing countries mill. bushels	Stock remaining at the end of season mill. bushels	Average price of British wheat per cwt.
1931-32 ..	1,240	880	360	—
1930-31 ..	1,350	804	546	6*s.* 0*d.*
1929-30 ..	1,130	662	468	8*s.* 10*d.*
1928-29 ..	1,420	886	536	9*s.* 11*d.*
1927-28 ..	1,110	801	309	10*s.* 3*d.*
1926-27 ..	1,070	819	251	11*s.* 11*d.*

It will be seen that the estimate of requirements of importing countries for the current season, 1931-32, is higher than in the past two years: this is partly based on the expectation that the European demand will be increased as a result of the poor rye crop, which is down by 150 million bushels compared with last year. This cereal is predominantly used for bread-making by large masses of the population of central and north-eastern Europe, and the short crop is likely to have an effect on the consumption of wheat, especially as for several years past the restricted purchases of certain countries have been due to good rye crops. The demand for wheat in the Far East is also likely to be increased by the damage done

by floods in China and by a poor rice crop in Japan; it will also be favoured if the recent improvement in the price of silver is maintained. The actual figure of imports must, of course, remain problematical until the year is much more advanced, but in the first 14 weeks of the season the total shipments recorded by the *Corn Trade News* have been at the rate of 855 million bushels per annum as against the estimate of 880 million bushels given above. Buying in this period, moreover, has been stimulated by rising prices, and large additions have been made to stocks, so that it is not certain that imports at this rate will be maintained. On the other hand, an increased European demand is more likely to show itself later in the season when home stocks begin to be exhausted.

In any event, the conclusion to be drawn from the calculation is that the carry-over at the end of the current season is likely to be reduced to "proportions still above the normal, but not such as to weigh excessively on the market." The importance of this anticipated reduction in stocks lies in its influence on future prices. The production of wheat in the world this year is estimated to be below the probable demand, and stocks are being drawn upon; if production next season (1932-33) should be only equal to (or less than) that of 1931-32, stocks must be further depleted—and any anticipation of such a position would be bound to lead to a rise in prices. This will make reports on the acreage sown for next year's harvest in the large producing countries of special importance, and indications of poor crops are likely to have an unusual influence on the market. In this connexion it may be noted that the Department of Agriculture has reported farmers' "intentions" to reduce the wheat acreage in the United States by some 12 per cent., but the official estimate of the area will not be issued till next month.

In September last it was suggested in these notes that there was a probability that prices would improve as the cereal year advances, and that "those growers of wheat who can afford to hold their grain over to next year should find it to their advantage to do so." Some rise in price has already taken place, but this advice still seems to hold good.

Cattle.—Supplies of fat cattle have been somewhat lighter than is usual at this time of year, but demand has been very quiet, and prices continue to weaken: first quality fat cattle in the second week of November were only averaging 43*s*. 0*d*. per live cwt. as compared with 48*s*. 6*d*. in the same week

last year. Beef prices have been correspondingly low, National Mark Prime falling to 6½*d.* per lb. Receipts of chilled beef from the River Plate continue on a moderate scale, and there is no undue competition from this source ; in fact, in several recent weeks Argentine chilled hind-quarters have been making better prices than English. The rise in the Argentine exchange will, presumably, tend to raise quotations for this class of meat, and if this occurs it should have a favourable effect on home prices. All meat prices are, however, related to one another, and little improvement in beef can be expected while mutton, lamb, pork and bacon continue at their present exceptionally low levels.

Sheep and Mutton.—Fat sheep and mutton prices continue to decline, first quality Downs and Crossbreds dropping early in November to 9¾*d.* per lb. and first quality mutton to 8½*d.* per lb., rates that were in each case 30 per cent. lower than at the same time last year. English supplies of fat sheep seem to have been about normal, but the market is depressed by the actual and prospective landings of frozen lamb. The new season has opened earlier than usual with very heavy shipments from Australia, 1,120,000 carcasses being shipped in September and October (arriving here in October and November) as compared with only 307,000 carcasses in the same months last year, while Argentine loadings are also larger. The total arrivals of frozen lamb in this country from Australia, New Zealand and Argentina in October amounted to 1,100,000 carcasses as against 560,000 in October, 1930 ; while, taking frozen mutton and lamb together as given in the Trade Returns, the total receipts were 528,000 cwt. against 300,000 cwt. in October, 1930, an increase of 76 per cent. The wholesale prices, as returned by the Imported Meat Trades Association, declined during the month by about 1*d.* a pound, and if imports should continue to be above last year's levels, it will be difficult to secure better prices for home supplies.

Pigs, Pork and Bacon.—As a consequence of the larger number of breeding sows in the country, fat pigs are being somewhat freely marketed, and the numbers on offer in the 10 weeks ending November 11 were about 15 per cent. higher than in the same period last year. Prices, after showing a slight increase, were practically unchanged on the month. Pork, though about 1*d.* a pound higher than in the summer, is low for the time of year, and has been realizing about one-

third less than last year's rates. It meets with a small but steady competition from frozen pork, of which 286,000 cwt. have been imported in the first 10 months of the year. New Zealand, Australia and Argentina are the largest contributors, and in recent weeks New Zealand and Australian pork has been fetching 7*d.* to 7½*d.* per lb. against English at 8¼*d.* to 9*d.* per lb.

Bacon continues to be imported in enormous quantities, receipts in October amounting to 974,000 cwt. It is now just about a year since bacon imports first showed their present great expansion, and they have remained remarkably steady at round about 950,000 cwt. a month for the past six months. The upward movement in feeding stuff prices that seems to be taking place is likely, however, to check further expansion in the stock of pigs on the Continent, while the Scandinavian countries which are no longer on the gold standard will find it relatively more expensive to import maize and other products, and consequently less profitable to feed pigs on purchased foods. There is, therefore, a prospect of reduced supplies, though not in the immediate future. Killings in Denmark in one week in October reached the exceptionally high figure of 166,000, the largest ever recorded, while in two other recent weeks 150,000 and 144,000 pigs have been slaughtered as against an average in the preceding quarter of 121,000 per week; in consequence prices have slumped very severely, and, on November 13, Danish bacon was quoted on the London Provision Exchange at 44*s.* to 48*s.* per cwt.—probably the lowest figure on record, at least in post-war years—while other foreign grades declined to a corresponding extent.

Store pigs, like fat pigs, are in large supply, the numbers on offer at markets during the 10 weeks ending November 11 being 28 per cent. greater than in the same period last year. This indicates a very ample supply of fat pigs for some time to come, and is against any early improvement in prices.

Potatoes.—The high prices obtainable for potatoes are drawing supplies to this country from abroad, chiefly from Holland, Belgium and Germany, but also, to some extent, from Denmark and Poland. The appearance of Denmark as an exporter of potatoes is a new feature, but Poland has exported small quantities in some previous years.

In 1924-25, the last occasion when there was a really poor potato crop in this country (though not so poor as this year), the total imports in the period when main crop potatoes arrive (September-April) amounted to 312,000 tons, or about

9 per cent. of the British crop. This year imports seem likely to be heavier, as in the two months September-October they have amounted to nearly 130,000 tons, of which 48,000 tons came from Germany and 42,000 tons from Holland. Crops in these countries are lower than last year, but the quantities likely to be exported form only a small percentage of the total production. Prices have risen appreciably, King Edwards at Wisbech, in the week ending November 11, making £7 to £7 10*s.* per ton f.o.r. Taking the year 1924 for comparison, the average price of that variety was about £8 15*s.* in October and £9 8*s.* in November, but the latter figure was the highest monthly average recorded, the prices in subsequent months showing a small decline.

Feeding Stuffs.—*Maize.*—It was suggested in these notes last month that maize prices were likely to be firmer, and rates moved up from about 4*s.* 2*d.* per cwt. in the middle of October (for 2-ton lots, in London) to 5*s.* 3*d.* per cwt. in the week ending November 11. Continued liberal supplies from Argentina, and offerings from other sources, caused some weakening in shippers' prices, and December futures in Buenos Ayres, though higher on the month, did not maintain the level reached at the end of October. Demand, both here and on the Continent, continues large, but available supplies in Argentina appear to indicate that shipments will necessarily be reduced shortly. Up to the present, the quantities loaded from Roumania and Danubian countries have been small, though better prices may draw larger supplies from this source. Imports into the United Kingdom in October were heavy, and the quantity landed in September and October together amounted to 10,706,000 cwt. as against 8,073,000 cwt. in the same months of 1930.

Barley.—Feeding barley, like maize, has shown a distinct rise in price during the past four weeks, consequent on reduced crops in the United States, Canada and Roumania, and uncertainty as to the prospects of supplies from Russia. In Canada, rates are nearly double the low quotations of last year. Imports into the United Kingdom are on a somewhat larger scale, the landings in September and October totalling 4,158,000 cwt. as against 3,493,000 cwt. in the same months of 1930. Prices of imported sorts have risen by about 2*s.* per cwt. on the month.

Oats.—Oats are also dearer, and supplies appear to be limited, imports into the United Kingdom—unlike those of other cereals—showing no material increase over last year.

Crops in the United States and Canada are much reduced, and prices show a definite rise, which is reflected in the rates asked for shipments from Canada to this country. As regards Argentina, which is the largest supplier to this country, the stocks remaining to be shipped before the new crop becomes available in the new year are quite small and prices are higher. The prospects of supplies from Russia are uncertain.

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DECEMBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

Arable Land.—Where the sugar-beet crop is a feature of the farm December is often a busy month. It is seldom that the lifting of the crop is done under such favourable weather and soil conditions as prevailed in 1931. In spite of a season that was rather sunless, and with a heavier rainfall than is usually experienced during the summer months, the crop returns are better than many growers expected. With all the circumstances fresh in mind the experiences during the past season should be considered. The success of sugar-beet as a crop has now been proved over a series of years, and those who have grown it most extensively and for a number of years can recognize the many advantages that it confers on arable land cultivation. During the past season the crop was generally more expensive to handle owing to the excessive prevalence of weeds due to the long-continued rains and the difficulty of getting on the land. Where hoeing was not effectively done the crop suffered severely, and the cash returns clearly emphasize any falling off in that direction. Even under good cultivation the crop this year is not likely to be large ; the roots are not so well shaped and there are more divided or fangy roots than usual. When excessive rains were experienced during the summer months in 1927, complaints as to the bad shape of the roots were frequent, and it may be that the greater amount of moisture at or near the surface of the soil is responsible for the development of more side roots. Fangy roots add much to the difficulty of lifting and cleaning, and in districts where long and costly transport is necessary the amount of tare is very important. In Sussex, where sugar-beet can be grown very successfully, the transport charges are usually £5 or more per acre.

Fortunately sugar content has been satisfactory. In view of

the heavy growth of tops and the apparently unripe condition of the beet, the sugar content has surprised many growers. It may be that the almost universal method of using complete manures, and applying the whole at the time of sowing the seed, is partly responsible, but behind all the cultural and manurial methods that can be tested by experiment it must be recognized that the weather has a dominating influence on sugar content. Bright sunlight seems to be less important than was at one time thought, and the feature of the present year would appear to be the steady growth that was apparent during the whole growing period.

The problem that faces the farmer in growing any crop at the present time is the high cost of production compared with the return obtained. It is necessary to use economical methods of cultivation and manuring, but when the gross output of a crop—such as sugar-beet—has a high value as compared with cereals or swedes or turnips, the fact is emphasized that money saved in cultivation and manuring can be more than lost in the reduced value of the crop. Sugar-beet is essentially a crop for intensive production. Cultural experiments do point to the importance of a full plant in the economy of the crop. Adequate seeding and efficient singling are most important. The cost of hoeing and singling, and the difficulty of getting the work done when the young beet plants are at the best stage, have directed attention to methods designed to overcome difficulties at this period. Spacing drills, mechanical bunchers, and cross drilling and cutting out with horse hoes have all been tried. As yet, none of these has met with complete success. Conditions must be ideal. Good hand work is still the best and most remunerative in ordinary circumstances.

Farmyard Manure.—Stock are now under winter conditions and require more labour, attention and concentrated food than when grass was abundant and the cattle constantly outside. Under winter conditions farmyard manure accumulates.

To the dairy farmer, farmyard manure is a by-product and does not always receive the care and attention that it deserves. The cattle fattener, on the other hand, does put great stress on the value of the manure produced, and this may be the only possible source of profit and is not infrequently the main object of cattle fattening.

Farmyard manure varies in quality according to the species and age of the animal that produces it, the class of litter and

the amount and kinds of foods consumed by the stock. Dairy cows take much more out of the foods used than do fattening cattle, and the manure is consequently poorer, though the difference is not such as to warrant neglect of the manure or depreciation of its value.

Better care in the production and storage of farmyard manure would preserve its value without incurring any undue labour or cost. A considerable amount of work has been done in this country and abroad upon the making and storage of farmyard manure, but it must be admitted that many of those engaged in the practice of agriculture do not realize the extent to which the valuable constituents of dung are lost, and the cause of the loss—or if so they fail to take the steps necessary to avoid such a loss. A few notes taken from a contribution on the subject from the Department of Soils in the University of Wisconsin, U.S.A., will illustrate some of the important points.

During the year the average dairy cow produces about 13 tons of manure containing about 130 lb. of nitrogen, of which 70 lb. are in the urine. The excrement from cattle consists of about 70 per cent. solid and 30 per cent. liquid by weight. The nitrogen in the dung varies from 0.2 to 0.45 per cent. and in the urine from 0.8 or less to over 1.5 per cent. If the dung and urine are mixed with enough straw as litter to absorb the whole of the liquid a complete manure is obtained, containing from 0·5 to 0·55 per cent. of nitrogen, half of which is from liquid manure. If this manure is allowed to stand a few days the nitrogen in the liquid manure changes to ammonia, and there results a manure that contains 10 to 12 lb. of nitrogen per ton, 5 to 6 lb. being in the form of ammonia. Analyses of farmyard manure from a number of farms showed that there was less ammonia-nitrogen in the samples than should be found if the total excrement was composted with the litter. The shortage indicated that there had been a loss of ammonia from the heap, or else that part of the liquid-manure nitrogen was not incorporated with it.

On many farms the liquids from the byre or the drainings from the manure heap are stored in underground tanks, and unless precautions are taken considerable loss of ammoniacal nitrogen occurs. When the liquid is stored alone the nitrogen changes to ammonium carbonate and is lost by volatilization. The loss may be reduced to a negligible quantity if the surface of the liquid in the tank is covered with a thin layer of mineral

oil; even in open tanks there is practically no loss of nitrogen through the oil layer.

The storage of farmyard manure should accomplish three things: (1) the inclusion of all the liquid excrement, (2) the prevention of any washing away, and (3) the maintenance of anaerobic conditions.

There has been much discussion as to the provision of a covered dungstead for the storage, and it has been concluded that a covering is not usually necessary; unless the rainfall is very heavy it is better for the manure to receive the normal rainfall provided there is no washing away of the soluble constituents. The rainfall provides the necessary moisture to produce and maintain anaerobic conditions.

The handling and spreading of anaerobically-stored dung must be done properly if minimum losses are to be obtained. Three-eighths to one-half of the nitrogen is easily lost by exposure to drying conditions. Warm, dry, sunny days with wind produce conditions that cause the greatest losses. If the spreading is done during cool rainy weather, and the manure is incorporated with the soil immediately, the losses may be reduced to a minimum. Mention is made that the practice of applying fresh manure to snow-covered fields in winter gave low handling losses, but if fresh manure is spread and allowed to lie on the land during warm, sunny weather, ammonification takes place within two or three days and the losses may be heavy.

The available nitrogen in farmyard manure is largely confined to the ammonia or water-soluble portion. Very little of the nitrogen in fresh manure is readily used by crops. Only in the case of fermented dung does any appreciable amount of the nitrogen become immediately available.

When straw is used for litter, and to absorb the liquid, it not only acts as an absorbent but also aids in decreasing the losses on drying after the manure is spread. In this respect the straw is an advantage, but it has the decided disadvantage of reducing the amount of manure-nitrogen recovered in the crop; the straw furnishes energy for the growth of soil organisms, with a resultant depression in the nitrate and available nitrogen. For this reason, the greater the amount of straw used as litter the greater is the depression in the availability of the manure-nitrogen. The depression is particularly marked in the first crop following the manure application.

It will be noted that these conclusions are in the main in

accord with the opinions at present held in this country. Many authorities will dispute the conclusion that there is no advantage in having a covered dung heap, but as we are not told exactly what is meant by a normal rainfall the conclusion may be quite correct for some districts. In this country it is generally agreed that the best manure is made in covered yards, where the manure is allowed to accumulate under the cattle and become very compact. It is generally recognized that manure made in open yards is much less valuable, and that where it is removed daily to a heap—a practice that is generally necessary on dairy farms—there are more opportunities for waste. In order to avoid waste, enough litter should be used to absorb as much as possible of the liquid manure, and the whole should be stored in well compacted heaps. Information as to the loss that occurs in handling will urge farmers who wish to avoid such loss to select suitable weather and deal with the manure with as much speed as possible.

The above discussion has referred only to the nitrogen content, but farmyard manure is also valuable for phosphoric acid, of which the content may be 5 lb. per ton, almost wholly contained in the solid manure and not liable to much risk of loss. For most crops, farmyard manure is deficient in phosphoric acid. Potash is also present at the rate of 7 lb. or more per ton, mainly in the liquid manure, and the loss of this ingredient will be in proportion to the liquid manure allowed to escape. The fertilizing effect is also increased by the addition of organic matter to the soil; this improves the texture and regulates the supply of water to a growing crop.

A rigid "no waste" policy in regard to farmyard manure would result in a material saving of fertilizing ingredients.

* * * * * *

NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
Rothamsted Experimental Station.

Concentrated Fertilizers.—In a previous issue of this JOURNAL an account was given of the newer concentrated fertilizers being developed on the Continent, and similar products now being made in this country by Imperial Chemical Industries, Ltd. Most of the tests made with ammonium phosphate or with high-analysis compound fertilizers based on it showed that the nutrients contained in these forms were as effective as equivalent nutrients in the more usual forms of combination. In the meantime the collected results of a series of comparative trials conducted by the experimental staff of Imperial Chemical Industries in various parts of the country have been published. The results are summarized as follows :—

		Yield per Acre.			
	No. of trials	Concentrated complete fertilizers	Ordinary mixture	No fertilizers	Criterion of significance
Potatoes, U.K. ..	10	13.05 tons	12.68 tons	6.93 tons	1.12 tons
,, Ireland	4	12.48 ,,	12.55 ,,	7.27 ,,	.82 ,,
Sugar beet ..	13	12.14 ,,	12.03 ,,	8.54 ,,	.72 ,,
Oats	13	26.4 cwt.	26.4 cwt.	19.2 cwt.	1.29 cwt.

Fertilizer treatment in either form gives a considerable increase over the untreated land. The lay-out of the experiments allowed of an estimate of the experimental error and consequently of the size of difference which must be attained before significance could be attached to the results. The figures show that the two types of mixtures have behaved very similarly, that is to say, the observed differences are well within what might be expected from chance causes. Further experiments on similar lines have been conducted during the past season in co-operation with Rothamsted, and the results so far as they are available are in harmony with the above.

The granular and dry condition of the complete fertilizer (10·4 per cent. nitrogen, 10·4 per cent. water-soluble phosphoric acid, and 20·8 per cent. potash) used in one of these experiments greatly facilitated hand sowing on the plots. It should be noted that the manures used in the above tests contained their phosphate in a water-soluble condition. There are other mixed fertilizers in the Imperial Chemical Industries series that are declared to contain insoluble phosphate in the form of Morocco phosphate. There need be no confusion, however,

between the two types, as the analyses and constituents are definitely stated.

It will be observed that, in the experiments mentioned above, it is the performance of the nutrients in the newer fertilizers that is in question. There is, however, another aspect of the case that requires more complicated experimental methods for its solution. Is the proportion of nitrogen, phosphoric acid, and potash in any given compound fertilizer that best suited to the conditions in view? To settle problems of this kind "balance" experiments of some complexity are necessary, and so far they have not been carried out on an extensive scale. When the ratio of nutrients for a given set of circumstances has once been determined by a series of such experiments it is not difficult to decide which of a range of mixed fertilizers contains approximately the optimum proportions of nitrogen, phosphoric acid and potash.

It is then a matter for farmers themselves to decide whether it suits them best—having regard to costs, labour of mixing and sowability—to make their own mixtures or to use as an equivalent factory-made compound fertilizer.

Phosphates on Grass Land.—There is perhaps no manurial practice more generally adopted than the phosphatic treatment of grass land. In very early times bones were used for this purpose, but it was not until the discovery of the fertilizing value of basic slag in the early 'eighties of last century, and the striking demonstrations of its suitability for pasture improvement at Cockle Park and elsewhere in the late 'nineties, that grass land began to receive phosphatic manures on a really large scale. Basic slag at the present time, some forty-five years after its introduction, is still by far our most important phosphatic fertilizer for grassland improvement. The modern basic slag is nevertheless not identical with the older product that brought about such changes in the productiveness of poor grass land, for the grade and composition of basic slag depend on the processes adopted in steel manufacture—and since these have gradually changed, so also has the product been modified, either beneficially or otherwise.

It is well known that the substitution of the Open-Hearth steel-making process for the older Bessemer process has had the effect of lowering the percentage of phosphoric acid in the slags, and also, in those cases in which fluorspar has been used in the furnaces, of reducing the solubility of the phosphoric acid as judged by the standard citric-acid test. Provided the agricultural value of the contained phosphorus is the same,

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a small change in grade, *i.e.*, percentage of total phosphoric acid, is of little importance, because this can be readily adjusted by increasing the rate of application. Any change in the efficiency of the phosphorus is a matter of more concern, and this is the aspect that has received much attention in recent experiments.

During the last ten years field and chemical investigations have been in progress to determine the agricultural value of such types of basic slag as were available in quantity, and to relate these as far as possible to their chemical composition. This work is under the direction of the Basic Slag Committee of the Ministry of Agriculture, and a few points extracted from the Ninth (1931) Report of the Committee may be of interest to users of basic slag and other phosphatic materials at this season.

Since the field experiments with phosphatic fertilizers will be of more direct interest to farmers than small-scale experiments in pots, attention will be confined to the former.

The treatments under investigation in 1930 were (1) Superphosphate, (2) High-soluble basic slag (96·5 per cent. citric solubility), (3) Low-soluble basic slag (23·0 per cent. citric solubility), (4) Ground rock phosphate, 120 mesh, (5) No phosphate. These plots were laid out in a series of hay experiments at several centres, and the manures were applied from the end of January to the second week in February, 1930, at the rate of 112 lb. P_2O_5 per acre—*i.e.*, about 6 cwt. per acre of superphosphate or its equivalent. The results discussed in the report refer to one season only and are those produced some six months after the distribution of the manures, and therefore give a picture of the immediate effect, which may be quite different from the total effect as measured over a period of years; hence the final showing can only come out as the experiments are continued without further additions of phosphate. The experiments were of modern type and permitted accurate comparisons to be made with a known margin of error. As far as yield of hay was concerned, at two out of six centres there were definite differences in the first hay crop. At one, superphosphate produced a better yield than the other four treatments, while high-soluble slag was more effective than low-soluble slag, mineral phosphate or no phosphate. At the other centre superphosphate was superior to rock phosphate and no phosphate. At the remaining four centres, although the order of yields was generally in the order of solubility, the differences

were not large enough to be significant. Bigger differences between the action of the phosphates were revealed in the composition of the hay in respect of protein and phosphoric-acid content, that is to say, in certain of the factors that go to make up the feeding-value of the hay. These quality factors in the hay, expressed as yield of protein and of phosphoric acid per acre, fall into line with the solubility of the phosphatic manures. They increased in the order no phosphate, rock phosphate, low-soluble slag, high-soluble slag, superphosphate. The fact that in the first season the quality differences were in many cases more marked than the yield differences, agrees with the observation that the effect of phosphatic treatment may be difficult to detect by merely weighing the produce although the experience of the grazier shows that the value of the pasture has been quite definitely improved.

Basic Slag.—This is the period for applying basic slag to grass land. The usual scale of dressings and the necessary surface preparation of the land have now been so much stressed that they are widely acted upon. There is still, however, some confusion in regard to the designation of the slags themselves. There are three points to notice in regard to basic slags :—

(1) Their degree of fineness through the prescribed sieve.
(2) Their content of total phosphoric acid.
(3) Their degree of solubility according to the standard citric-acid test.

The first item presents no confusion and is a fact almost invariably satisfactory. It is the distinction between the second and third points that is sometimes lost. The total phosphoric-acid content simply gives the percentage of phosphoric acid in the slag without any reference to its solubility in citric acid. It measures the grade, but does not distinguish between phosphoric acid that may be quickly available and that which may take longer to come into action. Both items (1) and (2) are compulsory declarations on sale. The third section gives the percentage of the total phosphoric acid that is dissolved under certain standard conditions by a dilute solution of citric acid. The object of this test is to obtain an estimate of the degree of availability of the phosphate in the slag. It is not suggested that the test is entirely satisfactory, but it appears to divide basic slags into two classes—a high-soluble group having a citric solubility of 80 per cent. or over, and a low-soluble group in which the solubility is 40 per cent. or less. Field and pot experiments carried out during the

last few years indicate that in general the first-year effect of the former class is greater than that of the latter.

In practice the statement of citric solubility is given, although it is not compulsory. The form is a guarantee that at least 80 per cent. of the total phosphate is citric-soluble by the usual test. This is a ready means of assigning basic slags to the classes mentioned above, and when immediate action is important buyers should particularly ask for the high-soluble guarantee. This distinction should not be taken to mean that the low-soluble slags are valueless. In certain parts of England they give quite satisfactory results, and in general they come into action after a period. They are also sold at distinctly lower prices than the high-soluble slags. Thus the price at works of basic slag containing 16½ per cent. of total phosphoric acid (36 per cent. total phosphate of lime) is about 2*s.* 10*d.* per unit if it is in the high-soluble class, but only 2*s.* per unit in the low-soluble class.

A further point in connexion with present-day home-produced basic slags is that the grade tends to rise. High-soluble slags containing 16½ per cent. phosphoric acid, equivalent to 36 per cent. phosphate of lime, are generally available, and it is understood that small qualities of even higher grade are now being made. Many users of basic slag who in previous years were accustomed to buy high-grade Bessemer slag containing 40 per cent. phosphate of lime still have a preference for similar material that is imported in small quantities from the Continent. The grades of home-produced slag mentioned above should, other things being equal, have the preference over the imported article.

* * * * * *

PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended November 11				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	8 10	8 10	8 10	8 10	11 0
,, ,, Granulated (N. 16%)	*	8 10	8 10	8 10	8 10	10 7
Nitro-chalk (N. 15½%) ..	*	7 5*d*	7 5*d*	7 5*d*	7 5*d*	9 4
Sulphate of ammonia :—	*					
Neutral (N. 20·6%)	*	6 10*d*	6 10*d*	6 10*d*	6 10*d*	6 4
Calcium cyanamide (N. 20·6%)	*	6 10*e*	6 10*e*	6 10*e*	6 10*e*	6 4
Kainit (Pot. 14%)	§	2 19*h*	2 14	2 14	3 0*g*	4 3
Potash salts (Pot. 30%) ..	§	4 15*h*	4 10	4 10	4 14*g*	3 2
,, (Pot. 20%) ..	§	3 8*h*	3 3	3 2	3 9*g*	3 5
Muriate of potash (Pot. 50%)..	§	9 1*h*	8 12	8 8	9 1*g*	3 7
Sulphate ,, (Pot. 48%)..	§	11 1*h*	10 9	10 9	11 0*g*	4 7
Basic slag (P.A. 15¾%)‖ ..	§	2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..	§	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A. 16%)	§	3 11	..	3 9	2 15*k*	3 5
,, (S.P.A. 13¾%)	§	3 5	2 9	3 3	2 10*k*	3 8
Bone meal (N. 3¾%, P.A. 20½%)	§	8 15	..	7 0	6 10	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	..	6 0	5 0	..
Burnt lump lime ..	§	1 4*p*	1 2*l*	1 9	1 19*n*	..
Ground lime	§	1 9*p*	1 8*l*	..	1 18*n*	..
,, limestone	§	1 3*p*	1 6*l*	1 7*m*	..	..
,, chalk	§	..	1 6*l*	..	1 6*n*	..
Slaked lime	§	..	..	2 9	2 10*n*	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid. Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots; at Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra, for lots of 2 tons and under 4 tons 5*s.* per ton extra, and for lots of 1 ton and under 2 tons 10*s.* extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

g Prices shown are f.o.r. northern rails; southern rails 2*s.* 6*d.* extra.

h Prices are ex ship; for delivery from store, kainit and potash salts are 6*s.*, and muriate and sulphate, 10*s.* per ton extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

l Carriage paid 6-ton lots Knottingley. Ground limestone 100% through standard sieve.

m In bags f.o.r. Liverpool. Fineness 45% through standard sieve.

n Carriage paid 4-ton lots London. In non-returnable bags, prices are 5*s.* per ton extra.

p Carriage paid 6-ton lots Bristol.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc.(Agric.),
Principal, Moulton Farm Institute, Northampton.

Food Requirement of Pigs.—The standard food requirements of pigs have been arrived at partly from experiment and partly from results obtained in practice. It would not be claimed that finality has been reached or that those standards now employed represent the last word on the subject. It is highly probable that they will have to be modified from time to time. Nevertheless, it is true that a ration adjusted in the light of existing information gives a return in live weight increase superior to that obtained from carelessly-compounded mixtures or from certain single foods. It is not unusual for some practical feeders to assert that they have used nothing but barley meal in the fattening of pigs, and that they have succeeded in finishing their pigs for slaughter on barley meal alone. This statement is no doubt true, but it is also true that, if barley meal is used alone, 6 to 7 lb. of the meal may be required to put on 1 lb. of live weight increase, whereas with a properly-balanced mixture—one adjusted to the pig's needs as at present understood—the 1 lb. of live weight increase is not uncommonly secured with 3½ to 4 lb. of food. In other words, the quantity of the balanced mixture required is only about two-thirds of that needed with barley meal alone. This represents a saving of 1 ton in 3. At present prices this may mean a bill of £17 for 2 tons of foods to make a balanced mixture compared with £24 for 3 tons of barley meal.

Feeders who carefully check the quantities of foods consumed in relation to the weights obtained are not slow to grasp the fact that the use of a balanced ration means money in pocket. That is one justification for the use of a balanced ration in preference to a single article, such as barley meal.

A comparison of progressive feeding-methods employed in this country and in Scandinavia has shown that the rations employed in the latter country are designed to supply much the same sort of amount and proportion of starch equivalent and protein equivalent as those commonly employed in Britain. A ration used at Svalof and elsewhere in Sweden for sows in milk consists of 10 fish meal, 10 bran, 40 finely-ground oatmeal, 40 barley meal (all per cent. by weight), fed in conjunction with 1½ gallons of separated milk daily. It will be found that 11 lb. of this ration plus the separated milk will supply approximately the same amount of S.E. and P.E. as about 11½ lb. of

either of the following rations: (1) 10 fish meal, 10 linseed-cake meal, 40 sharps, 20 barley meal, 20 flaked maize; (2) 10 fish meal, 10 crushed peas, 10 palm kernel cake, 30 sharps, 30 barley meal, 10 maize meal; actually about 7·65 lb. S.E. and 1·35 lb. P.E. in each case. For big sows suckling a good-sized litter these quantities will be necessary to maintain fair condition and produce an abundant yield of milk.

For in-pig sows and gilts living out of doors in winter it is advisable to allow rather more carbohydrate or starchy matter than in summer, in order to provide for the maintenance of bodily heat. The outdoor system has much to recommend it for its beneficial effects on building up constitution, in developing hardiness and in securing the fit active condition that is desirable in a breeding animal. On the other hand, when pigs are subjected to the cold and damp of winter, and are allowed unlimited exercise, more food is required to maintain body temperature and to provide energy for movement. In the case of fattening pigs, warm, comfortable quarters and restricted exercise will result in considerably lower food consumption. Scandinavian opinion is that it is cheaper to warm pigs with coal than with food, and fattening-houses are often provided with a heating apparatus for winter use. Even in this country, greater attention to the pigs' warmth and comfort during the winter months would result in economies in feeding, and give better all-round results in the rearing and fattening of pigs for pork or bacon. The feeding of warm food to pigs kept indoors in winter is to be recommended, both because it reduces the total quantity of food required and secures a quicker rate of development in the growing animal.

In cold, sunless winter weather little ultra-violet light will be obtained from the sun. In the absence of sunlight as the natural source of ultra-violet rays, cod liver oil may be used as a substitute. It has recently been pointed out that the feeding of mineral matter in winter may not be beneficial unless cod liver oil is given in conjunction with minerals. Practical pig-keepers have long recognized the value of cod liver oil for winter feeding to newly weaned and young growing pigs. Unfortunately when cod liver oil is used in quantity it will readily taint the carcass. It is therefore advisable strictly to limit its use, and to cease employing it for a month or three weeks before the pigs are slaughtered. Actually, it is weaners and pigs in the early stages of preparation for slaughter that have most need of the cod liver oil, so that

those approaching the heavier pork or bacon weights are not likely to suffer seriously from its withdrawal. The case of small porkers to be killed at round about 64 lb. dead weight presents greater difficulty and necessitates more care in management. For the production of small pork in winter, milk is an invaluable aid, either as whole milk, if it can be obtained at a sufficiently low price, or, failing that, in the form of separated milk. Dairy by-products coupled with good housing and the utilization of available sunlight are highly important factors in pig production.

Fibre in Poultry Feeding.—Investigations that have been carried out recently have demonstrated that poultry can only deal satisfactorily with a comparatively small proportion of indigestible fibre in their food, and also that this fibrous material should be given regularly. When birds are kept under artificial conditions it is specially important that fibrous material should be provided in small quantity at any one time. During the last few years there has been a general tendency to reduce the amount of fibrous material fed to adult birds and chickens, more especially when these are kept intensively. Foods such as flaked maize and biscuit meal have been favoured. Chickens reared intensively have received little or no grass or other green vegetable material such as they ordinarily pick up when they have access to an outdoor run.

It has been observed by the Chief Poultry Instructress at this Institute that when chicks were reared intensively to the age of from 5 to 10 weeks and then turned out of doors on grass runs, in certain cases trouble of varying seriousness occurred. In more than one instance the trouble resulted in a number of deaths, and post-mortem examination revealed that the chicks were suffering from severe impaction of the gizzard, due to the presence of an abnormally large amount of fibrous material. This material was found, on investigation, to be mostly dried grass which the chickens had picked up in relatively large quantity on their first being turned loose on a grass run and when corn was given to them by throwing it on the grass. The trouble apparently arose through their inability to deal adequately with the sudden consumption of fibrous material. Affected birds were treated by giving them a weak solution of hydrochloric acid in the drinking water—one teaspoonful to 1 gal. of water—with entirely satisfactory results. The hydrochloric

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	6 15	0 10	6 5	72	1 9	0·94	9·6
Barley, British feeding	—	—	6 15	0 8	6 7	71	1 9	0·94	6·2
„ Persian	25 0	400	7 0	0 8	6 12	71	1 10	0·98	6·2
„ Russian	25 0	„	7 0	0 8	6 12	71	1 10	0·98	6·2
Oats, English, white	—	—	7 10	0 8	7 2	60	2 4	1·25	7·6
„ „ black and grey	—	—	6 13	0 8	6 5	60	2 1	1·12	7·6
„ Canadian No. 2 Western	22 6	320	7 17§	0 8	7 9	60	2 6	1·34	7·6
„ Argentine	20 9	„	7 5	0 8	6 17	60	2 3	1·20	7·6
„ Russian	22 9	„	8 0	0 8	7 12	60	2 6	1·34	7·6
Maize, Argentine	23 9	480	5 10	0 8	5 2	81	1 3	0·67	6·8
Beans, English winter	—	—	6 0§	0 19	5 1	66	1 6	0·80	20
Peas, English blue	—	—	12 0§	0 16	11 4	69	3 3	1·74	18
Milling offals—									
Bran, British	—	—	5 15	0 18	4 17	42	2 4	1·25	10
„ broad	—	—	6 7	0 18	5 9	42	2 7	1·38	10
Middlings, fine imported	—	—	6 12	0 14	5 18	69	1 9	0·94	12
„ coarse, British	—	—	6 2	0 14	5 8	58	1 10	0·98	11
Pollards, imported	—	—	5 10	0 18	4 12	60	1 6	0·80	11
Meal, barley	—	—	8 0	0 8	7 12	71	2 2	1·16	6·2
„ maize	—	—	6 5	0 8	5 17	81	1 5	0·76	6·8
„ „ germ	—	—	6 12	0 12	6 0	85	1 5	0·76	10
„ locust bean	—	—	5 15	0 6	5 9	71	1 6	0·80	3·6
„ bean	—	—	8 0	0 19	7 1	66	2 2	1·16	20
„ fish	—	—	15 0	2 14	12 6	53	4 8	2·50	48
Maize, cooked flaked	—	—	7 5	0 8	6 17	83	1 8	0·89	8·6
„ gluten feed	—	—	6 2	0 14	5 8	76	1 5	0·76	19
Linseed cake, English, 12% oil	—	—	8 17	1 3	7 14	74	2 1	1·12	25
„ „ „ 9% „	—	—	8 10	1 3	7 7	74	2 0	1·07	25
„ „ „ 8% „	—	—	8 5	1 3	7 2	74	1 11	1·03	25
Soya bean cake, 5½% oil	—	—	8 2*	1 11	6 11	69	1 11	1·03	36
Cottonseed cake—									
„ „ English 4½% oil	—	—	5 12	1 2	4 10	42	2 2	1·16	17
„ „ Egyptian 4½% „	—	—	5 7	1 2	4 5	42	2 0	1·07	17
Ground nut cake, 6-7% oil	—	—	7 15*	1 0	6 15	57	2 4	1·25	27
Decorticated ground nut cake, 6-7% oil	—	—	8 2	1 11	6 11	73	1 10	0·98	41
Palm kernel cake, 4½-5½% oil	—	—	6 10†	0 13	5 17	75	1 7	0·85	17
„ „ meal, 1-2% „	—	—	5 12	0 14	4 18	71	1 5	0·76	17
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	6 5	0 14	5 11	48	2 4	1·25	13
„ „ „ porter	—	—	5 15	0 14	5 1	48	2 1	1·12	13
Malt culms	—	—	5 10†	1 2	4 8	43	2 1	1·12	16
Dried sugar beet pulp (*a*)	—	—	4 7	0 6	4 1	65	1 3	0·67	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 14*s.* per ton as shown above, the food value per ton is £6 6*s.* Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1*s.* 9*d.* Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94*d.* A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N, 6*s.* 4*d.*; P_2O_5, 3*s.* 7*d.*; K_2O, 3*s.* 2*d.*

acid was apparently an aid to the dissolving of the fibre, and in this way relieved the impaction of the gizzard. Further trouble was prevented by temporarily feeding the corn in troughs and in the litter in the houses, and not on the grass.

The instance quoted points to the need for additional care when chicks from battery brooders or from other intensive

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Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	7 0
Maize	81	6·8	5 10
Decorticated ground-nut cake	73	41·0	8 2
„ cotton cake	71	34·0	7 0

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·69 shillings, and per unit protein equivalent, 1·05 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1930, issue of the Ministry's JOURNAL.)

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 12
Oats	60	7·6	5 9
Barley	71	6·2	6 6
Potatoes	18	0·6	1 11
Swedes	7	0·7	0 12
Mangolds	7	0·4	0 12
Beans	66	20·0	6 12
Good meadow hay	37	4·6	3 7
Good oat straw	20	0·9	1 15
Good clover hay	38	7·0	3 11
Vetch and oat silage	13	1·6	1 3
Barley straw	23	0·7	1 19
Wheat straw	13	0·1	1 2
Bean straw	23	1·7	2 0

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6*d.* net.

conditions are first turned out on grass runs. Such care should be exercised to ensure that the chicks get only a restricted amount of fibrous material for some little time until they have become used to it. It is satisfactory to note that the simple measures described above were sufficient to overcome the trouble that had arisen. In view of the approach of the hatching-season and the increasing employment of battery brooders, and intensive methods of rearing generally, it may be opportune to draw attention to the possible occurrence of trouble of this kind in the coming season.

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MISCELLANEOUS NOTES

The Use of Lime in Agriculture

ALTHOUGH liming is one of the oldest operations of British agriculture, it is widely recognized that it has been neglected during the last fifty years. Indeed, much land is making very uneconomical use of the labour and manures put into it because of inattention to liming. In various parts of the country there is evidence, on almost every type of soil, that a return to the practice of liming or chalking is essential if the fertility of the soil is to be maintained.

This Bulletin* (which is a revision, by Mr. H. V. Garner, M.A., B.Sc., of Rothamsted Experimental Station, of an earlier publication issued by the Ministry) should therefore be of wide interest to all farmers. It deals with the need for lime, the comparative value of the different forms, the time of application, quantities to apply, and duration of effect.

The publication is attractively bound in an art-paper cover and well illustrated.

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Indian Agricultural Journals

AGRICULTURAL students and others who anticipate taking up a career in India or the tropics will be interested in the new series of publications issued under the auspices of the Imperial Council of Agricultural Research at New Delhi. Of these *Agriculture and Livestock in India* is a bi-monthly journal for the general reader seeking information in regard to agriculture or live-stock. The first part consists of original articles by specialists in their various branches, and this is followed by selected

* Bulletin No. 35, *The Use of Lime in Agriculture*, obtainable through any bookseller, or from H.M. Stationery Office, price 6*d*. (7*d*. post free).

articles, papers and abstracts from other periodicals, notes, appointments, reviews and correspondence. The subscription, including Indian postage, has been fixed at 9*s.* 9*d.* per annum payable in advance, or 2*s.* 6*d.* per part. *The Indian Journal of Agricultural Science*, also bi-monthly, is of a more technical character, being mainly devoted to the results of original research and field experiments. The annual subscription is 16*s.* 6*d.*, the price of each part being 4*s.* 6*d.* inclusive of Indian postage. *The Indian Journal of Veterinary Science and Animal Husbandry* deals with all matters relating to the health, nutrition and breeding of livestock. The subscription is 8*s.* 3*d.* a year, or 3*s.* 6*d.* each part. These last two journals supersede the Bulletins of the Agricultural Research Institute at Pusa, and the Memoirs of the Department of Agriculture in India, which will no longer be issued separately. All three journals are well illustrated, and contain useful diagrams and graphs. In examining papers submitted for publication, their editorial committees enjoy the collaboration of a number of scientific workers throughout India. Copies of the above periodicals can be obtained from the Manager, Government of India Central Publication Branch, 3 Government Place, West, Calcutta.

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International Rabbit Breeders' Congress

THE proceedings of the 1st International Rabbit Breeders' Congress, which was held in Leipzig from August 24-31, 1930, have just been published. The report has been prepared by Professor Dr. Hans Nachtsheim, the organizer of the Congress, which took place as a sectional proceeding in the International Fur Trade Exhibition held from May to September, 1930.

Delegates from 15 countries attended the Congress: Belgium, Germany, France, Great Britain, Holland, Italy, Luxemburg, Austria, Poland, Sweden, Switzerland, Czechoslovakia, Hungary, Union of the Socialist Soviet Republics and the United States of America. The British delegates were Mr. J. Hammond, Animal Nutrition Institute, Cambridge University; Professor R. T. Parkhurst, Director, National Institute of Poultry Husbandry; Dr. J. N. Pickard, Animal Breeding Research Department, Edinburgh University; Mr. M. S. Pease, Small Animal Breeding Institute, Cambridge University; and Mr. W. King Wilson, Rabbit Department, National Institute of Poultry Husbandry.

The programme commenced with a general welcome of participants by Dr. Nachtsheim in the White Hall of Leipzig Zoological Garden. The second day's programme consisted of a general meeting of delegates and rabbit breeders in the Palm Garden, where addresses were delivered by representatives of the working committee, the public authorities (including the Minister of Agriculture), the municipal authorities, the exhibition organizers, and the rabbit-breeding societies and organizations. This meeting was attended by approximately 400 people. Later in the day an organized visit was made to a zoological collection of fur-bearing animals, and, subsequently, to the International Rabbit Exhibition. At the latter, live rabbits were exhibited by breeders from England, Finland, Holland, Austria, Switzerland, Germany and France. In an adjacent technical exhibition hall a particularly interesting display of mounted specimens of rabbits was included in a stand devoted to technical rabbit-breeding problems. The official delegates were afterwards entertained by the Burgomaster of Leipzig.

The succeeding days were devoted to paper-reading conferences in the Veterinary School of Leipzig University. Papers on practically all aspects of the rabbit industry in its many technical and practical sections were read by individuals from Belgium, France, Great Britain, Italy, Netherlands, Russia, United States of America, Germany, Switzerland and Luxemburg. The papers prepared by the British section were as follows: "The Organization of Rabbit Education and Investigation in Great Britain," by R. T. Parkhurst; "The Processes of Reproduction in the Rabbit," by J. Hammond; "The Inheritance of Yellow Fat in Rabbits," by M. S. Pease; "Angora Rabbits and Angora Rabbit Wool Production in Great Britain," by J. N. Pickard; "The General Position of Rabbit Breeding in England," by E. C. Richardson; "Rabbit Fur Production in England," by W. Brumwell; "On Rabbit Nutrition, with Reference to Work at Harper Adams College," by W. King Wilson. Another paper in English was "Rabbit Raising in the United States," by F. G. Ashbrook. In addition to the above, films were presented illustrating phases of rabbit keeping in France and the United States of America.

The closing programme included a full-day excursion in Saxony and Thuringia, and a visit to a large rabbit-farm at Olbersleben, and finally a journey to Berlin to inspect the rabbitry and buildings of the Institut für Vererbungsforschung

at the Agricultural College at Berlin-Dahlem. Dr. Nachtsheim conducted the party and explained the genetical rabbit-breeding investigations in progress.

Throughout the Congress the Fur Industry Exhibition near-by contained examples of all methods of utilizing the rabbit fur, including the first stages of production, dressing, conversion and manufacture, and the weaving of manufactured garments.

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The Agricultural Index Number

THE October index of agricultural produce at 13 per cent. above 1911-13 was 7 points lower than in September and 16 points below the level of October last year. Although a fall of 7 points in the general index number was recorded on the month, wheat and potatoes were considerably dearer, while there were also seasonal increases in values of butter, eggs and pork pigs, but these increases were more than offset by the very considerable drop in milk prices. There was in addition a further depreciation in livestock values during the month under review, while hay was again cheaper.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month.	*Percentage increase compared with the average of the corresponding month in 1911-13.*					
	1926.	1927.	1928.	1929.	1930.	1931.
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August	49	42	44	52	35	21
September	55	43	44	52	42	20
October	48	40	39	42	29	13
November	48	37	41	44	29	—
December	46	38	40	43	26	—

Grain.—Quotations for wheat showed a substantial increase during October, the average price of 5*s.* 8*d.* per cwt. being 11*d.* higher on the month and the relative index number moved upwards by 13 points to 24 per cent. below the level of the base years. A year ago the index stood at 7 per cent. below pre-war and a reduction of 4*d.* per cwt. occurred between September and October. Oats also were dearer than in the previous month, the average price of 6*s.* 2*d.* per cwt. showing

an increase of 7*d.* and the index figure was 6 points higher at 11 per cent. below the level in the corresponding period in 1911-13. Barley, however, at an average of 9*s.* 2*d.* per cwt. was 8*d.* per cwt. cheaper than in September, and the index figure fell by 10 points to 8 per cent. above the level of the base period as compared with 13 per cent. above pre-war a year ago.

Livestock.—Quotations for livestock for the most part have shown a further reduction during the month under review. Fat cattle, sheep and bacon pigs were a little cheaper than in October, the respective indices being 4, 3 and 2 points lower on the month. Values for store cattle, sheep and pigs also continued to move downwards during October with corresponding falls in the index figures. The usual seasonal advances were noticeable, however, in the case of pork pigs and dairy cows and the relative indices were one and two points higher than in the previous month.

Dairy and Poultry Produce.—The position as regards milk in October has been rather exceptional in that the contract terms agreed for the year October, 1931-September, 1932, provide for a comparatively uniform price during the whole of the year instead of the usual large variation between the winter and summer months. This state of affairs has no precedent in pre-war or post-war years and has resulted in the index figure for the month under review falling to 19 per cent. above the level of the base years, whereas the index at the corresponding period last year was 47 per cent. above and 55 per cent. above in the previous October. Butter was a little dearer on the month, but as this seasonal rise was proportionately smaller than in the base period the index number fell by 2 points to 5 per cent. above pre-war. A year ago butter stood at 14 per cent. above the base level. Cheese was a little dearer during October, but the index was unaltered at 8 per cent. above 1911-13. The seasonal advance in egg prices continued evident during October and the index figure moved upwards by 9 points to 29 per cent. above pre-war, or 27 points below the figure in October, 1930. The indices for fowls and ducks were 4 and 9 points lower respectively on the month, but that for geese was 4 points higher. The combined index for poultry, however, showed no change on the month at 30 per cent. above pre-war.

Other Commodities.—As a result of the short crop of potatoes in 1931 there has been a further considerable rise in prices during October, the index showing an advance of 25 points

to a level of 110 per cent. above pre-war, or the highest figure reached since June, 1928. Hay was again rather cheaper in October and the index figure was 5 points lower on the month. Wool prices showed a recovery from those ruling in the previous month and the index was 5 points higher than in October at 25 per cent. below the pre-war level. Apples were dearer in October than at the corresponding period last year, the index being about 50 per cent. above pre-war, as against about 25 per cent. above in October, 1930. Vegetables were cheaper on the month, the relative index falling by 22 points to 19 per cent. above pre-war, while a year ago the level was 36 per cent. above that of 1911-13.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13.

Commodity	1929	1930	1931			
	Oct.	Oct.	July	Aug.	Sept.	Oct.
Wheat	27	— 7*	—23*	—21*	—37*	—24*
Barley	21	13	—19*	Nil.	18	8
Oats	12	—12*	—12*	— 8*	—17*	—11*
Fat cattle	31	31	29	29	22	18
,, sheep	55	62	38	38	31	28
Bacon pigs	50	25	Nil.	— 5*	—10*	—12*
Pork ,,	64	45	10	5	2	3
Dairy cows	34	30	27	25	20	22
Store cattle	11	27	31	31	23	18
,, sheep	53	62	53	40	33	18
,, pigs	95	107	31	32	29	31
Eggs	81	56	19	17	20	29
Poultry	45	39	44	31	30	30
Milk	55	47	52	55	57	19
Butter	55	14	10	10	7	5
Cheese	37	17	28	23	8	8
Potatoes	17	40	79	45	85	110
Hay	49	— 4*	—13*	—12*	—14*	—19*
Wool	42	—12*	—34*	—31*	—30*	—25*

*Decrease.

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Young Farmers' Clubs : Judging Competitions, 1931

By courtesy of the British Dairy Farmers' Association the Young Farmers' Clubs Annual Dairy Cow Judging Competition took place at the Dairy Show on October 21 and 22. Fifteen teams of three members each competed as against nine teams in 1930 and six in 1929; it was therefore necessary to arrange an eliminating contest to decide which teams should compete in the final event. On October 21 two judging rings were provided and operated

simultaneously, seven teams working in Ring I and eight in Ring II. All the teams judged the same breeds, namely, Dairy Shorthorn, Friesian and Jersey, and one competitor from each team gave verbal reasons for placing each breed. The three teams in each ring that secured highest marks were eligible to compete in the final contest. The preliminary competition resulted as follows :—

RING I

Order of teams	*Points*
1st Northallerton ..	615
2nd Horsham "B" ..	600
3rd Buckingham "B"	574
4th Withleigh	566
5th Stockton "A" ..	565
6th Northumberland "A"	552
7th Cuckfield	543

RING II

Order of teams	*Points*
1st Northumberland "B"	608
2nd Collingham ..	602
3rd Deene..	559
4th Kingsclere	557
5th Horsham "A" ..	550
6th Stokesley	542
7th Stockton "B" ..	541
8th Buckingham "A" ..	533

On the following day the selected teams judged Dairy Shorthorns, Friesians and Guernseys, the three members of each team giving their reasons for placing each breed. The keenness of the competition is reflected in the result.

Order of teams	*Points*	*Highest individual competitors*	*Points*
1st Bucks "B"	832	1st Florence Busby (Bucks "B")	300
2nd Deene..	831	2nd Alec Thomson (Deene)	294
3rd Northumberland "B"	827	Matthew Laidler (Northumberland "B")	
4th Horsham "B" ..	805	4th Doris Lee (Horsham "B")	291
5th Collingham	793	5th Douglas Keen (Deene)	277
6th Northallerton ..	792	6th C. Brown (Bucks "B") / Joyce Holland (Collingham)	275

After the contest the *Farmer and Stock Breeder* Silver Challenge Cup was presented by Mr. J. H. Whitley, Vice-President of the British Dairy Farmers' Association, to the Buckinghamshire "B" team; he also presented the British Dairy Farmers' Association Silver Medal to Florence Busby and Bronze Medals to Alec Thomson and Matthew Laidler.

It is worthy of note that five of the competing teams were making their first appearance in this contest and that Deene Young Farmers' Club, which was only defeated by the narrowest possible margin, was founded less than twelve months ago. The judges were Messrs. M. D. Bannister, W. Burkitt, A. Weightman and Professor J. A. S. Watson.

An Annual Poultry Judging Contest on the same lines as the Cattle Judging Competition was inaugurated at the Show on October 23 by the National Association of Young Farmers' Clubs, a small Silver Cup being provided by a few anonymous friends of the movement. An encouraging entry of eight teams was received, seven of which actually competed.

The competitors judged three rings each of four birds of the Light Sussex, White Leghorn and White Wyandotte breeds, and gave to the judges verbal reasons for their decisions.

The result was as follows :—

Order of teams	*Points*		*Highest individual competitors*	*Points*
1st Shipley (W. Sussex) ..	750			
2nd Hurstmonceux (E. Sussex) ..	725	1st	Bessie Merritt (Hurstmonceux) / Alfred Rapley (Shipley)	270
3rd High Hurstwood (E. Sussex) ..	635			
4th Swanley (Kent) ..	585	3rd	Doris Honeysett (Hurstmonceux) / Charles Scutt (Shipley)	255
5th Barming (Kent) ..	454			
6th Rodmell (E. Sussex) ..	445			
7th Brasted (Kent) ..	398	5th	F. Bourne (Swanley) ..	245
		6th	Ivy Bailey (Hurstmonceux) ..	230

After the contest the Silver Cup was presented to the Shipley team by Miss Scovell, who also presented medals awarded by the British Dairy Farmers' Association, silver to Bessie Merritt and Alfred Rapley, and bronze to Doris Honeysett and Charles Scutt.

Messrs. W. W. Broomhead and A. Noel Spong acted as judges.

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Poultry-keeping on the Farm

THE following progress report on the two-year Demonstration in Poultry-keeping, using slatted-floor houses, at Stanmore, Middlesex,* has been forwarded by Mr. J. Worthington, the County Poultry Instructor. The particulars given are for the three months ended September 30 last, completing the pullet-year of the initial flock.

Stock and Feeding.—The original flock of 1,024 birds having been reduced by casualties and culling to 746, the number has been made up by taking in 250 first-cross White Leghorn × Rhode Island Red pullets. The 122 deaths during the year meant an unexpected mortality, but it must be remembered

* Previous notes on this subject have appeared in the issues of this JOURNAL for May (p. 217), July (p. 447) and September (p. 669) this year.

that the standard of the original flock was not very high. Both old and new birds have been fed alike on the usual cereal meals, with an addition of 5 per cent. meat-and-bone meal and 10 per cent. decorticated ground-nut cake. Trough-feeding has been discontinued in some pens, and the grain, fed in the evening, has been scattered in the grass, which, on account of the wet season, has recovered better than was expected. Food consumption for the quarter has been grain, 510 cwt.; mash, 532½ cwt.; minerals, 10 cwt.; cod liver oil, 3 gal.; shell, 40 cwt. Grains averaged in price 6*s.* 6*d.* per cwt., and mash, 6*s.* 8*d.*

Housing.—Experience of the housing—an experimental design—has shown points for further improvement. Crowding in the nests and excessive breakage of eggs have already been noted. The alighting board has been a source of injury to legs and wings. The exits need to be wider; handling of the birds has been a difficulty, and the larger the house the more marked it becomes. The fitting of the attendant's door with a bottom hinged flap, opening outwards and upwards, would facilitate both culling operations and the passage of the birds. The striking advantages of this type of house, however, are the excellent health maintained by the birds, the reduction in capital expenditure and labour, and the elimination of litter with its corollary—lice.

Egg-Production.—During the quarter, 36,326 saleable and 880 defective eggs were produced, making a total of 175,962 for the year from the survivors of the original flock. The 250 pullets, which came into lay earlier than their predecessors of last year, produced 4,312 saleable and 54 defective eggs. Although when this report was prepared (October 21) the pullets were laying at the rate of three eggs to two produced by the hens, the latter, on account of better egg-size, were bringing in nearly as much revenue per head. It would seem, therefore, sound practice to retain a proportion of yearlings, provided that they have been drastically culled, and that late-hatched pullets, if kept in production until well into the autumn, are profitable. Loss due to the late start last autumn appears to have been made up to some extent by persistency this autumn.

Miscellaneous.—The pullets were inoculated in August last. A "sprinkler-cork" was fitted to the bottle of vaccine, the resulting few drops proving just as effective and very much less wasteful than application by brush: one bottle of 80 doses was more than sufficient for the 250 birds. Rats have

appeared on the farm and are held responsible for several cases of bleeding feet; and crows have been noted as egg thieves.

* * * * *

Potato Acreages in Scotland, 1931

THE following table, which has been prepared from a statement issued by the Department of Agriculture for Scotland, shows the acreages of potatoes grown in Scotland in 1931 with corresponding acreages in 1930.

	1931 *Acres*	1930 *Acres*
Total acreage grown	128,000	123,358
Total first earlies	12,532	13,120
Total second earlies	13,323	15,362
Total main crops	85,394	76,953
Area unclassified	16,751	17,923

Acreage figures for the most important varieties only are as under :—

	1931 *Acres*	1930 *Acres*
FIRST EARLIES :—		
Epicure	7,218	7,703
Duke of York, etc.	1,539	1,794
Sharpe's Express	1,605	1,712
Eclipse, etc.	1,255	948
Ninetyfold	215	209
May Queen	111	127
SECOND EARLIES :—		
Great Scot	7,816	10,059
British Queen, etc.	3,781	3,518
Ally	250	339
Arran Comrade	280	331
Royal Kidney, etc.	370	252
MAIN CROPS :—		
Immune :—		
Kerr's Pink	45,766	39,097
Golden Wonder, etc.	9,374	7,986
Majestic	6,732	5,657
Arran Banner	769	678
Arran Consul	656	617
Non-immune :—		
King Edward, etc.	14,987	15,146
Arran Chief	2,296	3,035
Up-to-date, etc.	1,087	1,195
Field Marshal	450	434

There was an increase of approximately 4,600 acres in the total acreage of potatoes planted in Scotland in 1931 as compared with a decrease of about 21,000 in the preceding year. The acreage of first and second earlies was reduced in 1931 by 2,627 acres, the fall in first earlies being 4·5 per cent. and in

second earlies over 13 per cent., while main-crop potatoes increased by 8,441 acres or 11 per cent. The increase in main crop was due to the greater acreage of immune varieties, such as Kerr's Pink, Golden Wonder and Majestic, while the non-immunes such as King Edward, Arran Chief and Up-to-date show a decline. With the exception of Eclipse, Ninetyfold, British Queen and Royal Kidney the principal first and second earlies show reduced acreages, the most pronounced fall being that of 2,243 acres or 22 per cent. for Great Scot.

An estimate of the yield of potatoes in Scotland for 1931 is not yet available, but it is anticipated that in the majority of districts it will be below average, and in this connexion it is of interest to note that the preliminary estimate of the average yield per acre in England and Wales in 1931 was 5·3 tons, or 1·2 tons below that of 1930.

* * * * * *

Agricultural Machinery Testing Committee

THE undermentioned Certificates and Reports, issued by the Ministry in respect of performances, under test, of milk filter discs, have been printed and issued in pamphlet form. Copies of the respective pamphlets can be obtained, at the prices stated, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

(*a*) No. 32. The "Zobec" Cotton Wool-and-Gauze Milk Filter Discs.

(*b*) No. 33. The "Rapid Flo" Cotton Wool Milk Filter Discs.

Submitted for test by the manufacturers, Messrs. Johnson & Johnson (Great Britain) Ltd., Slough, Bucks. (Each pamphlet 2*d*. net, post free, 2½*d*.)

* * * * * *

Farm Workers' Minimum Wages.—Meetings of the Agricultural Wages Board were held on October 20 and November 12, 1931, at 7 Whitehall Place, London, S.W. 1, the Chairman, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders carrying into effect the Committees' decisions :—

Berkshire.—An Order cancelling, as from October 30, the existing minimum and overtime rates of wages, and fixing fresh rates to come into force on October 31 and to continue in operation until March 4, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s*. per week of 41 hours in the week in which Christmas Day falls and 50 hours (instead of 52½ hours as at present) in any other week.

The overtime rate for male workers of 21 years of age and over is 8½*d*. per hour.

In the case of female workers of 19 years of age and over, the minimum rate is 5*d.* per hour for all time worked.

Cambridgeshire and Isle of Ely.—An Order continuing the operation of the existing minimum and overtime rates of wages until April 30, 1932.

The minimum rate in the case of male workers of 21 years of age and over, employed wholly or mainly as horsemen, cowmen, or shepherds, is 37*s.* per week of the hours necessary for the performance of the customary duties of workers so employed, and in the case of other male workers of the same age 30*s.* per week of 40 hours in the week in which Christmas Day falls, 48 hours in any other week in winter, 42 in the week in which Good Friday falls, and 50 in any other week in summer.

In the case of male workers of 21 years of age and over other than horsemen, cowmen, and shepherds, the overtime rate is 9*d.* per hour on weekdays and 11*d.* per hour on Sundays, Christmas Day and Good Friday.

In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour, with overtime at 7*d.* per hour.

Cheshire.—An Order fixing minimum and overtime rates of wages to come into operation on November 1 and to continue in force until October 31, 1932. The minimum rate, in the case of male workers of 21 years of age and over, is 32*s.* 6*d.* (instead of 35*s.* as at present) per week of 54 hours, with overtime at 8½*d.* per hour (instead of 9*d.* per hour as at present).

In the case of female workers of 18 years of age and over, the minimum rate is 6*d.* per hour for all time worked.

Gloucestershire.—An Order fixing minimum and overtime rates of wages to come into operation on November 1 and to continue in force until October 1, 1932.

The minimum rates in the case of male workers of 21 years of age and over are as follows :—

Head Carters.—In winter 34*s.* 2½*d.* per week of 52½ hours in the week in which Christmas Day falls and 60 hours in any other week. In summer 32*s.* 9½*d.* per week of 51 hours in the week in which Good Friday falls and 58 hours in any other week.

Under Carters.—In winter 32*s.* 9½*d.* per week of 50¼ hours in the week in which Christmas Day falls and 57 hours in any other week. In summer 30*s.* 10½*d.* per week of 48 hours in the week in which Good Friday falls and 54 hours in any other week.

Head Shepherds or Head Stockmen.—34*s.* 2½*d.* per week of 52½ hours in the weeks in which Christmas Day and Good Friday fall and 60 hours in any other week.

Under Shepherds and Under Stockmen.—32*s.* 9½*d.* per week of 50¼ hours in the weeks in which Christmas Day and Good Friday fall and 57 hours in any other week.

Other Male Workers.—28*s.* 6*d.* per week of 39½ hours in the week in which Christmas Day falls, 48 hours in any other week in winter, 41 hours in the week in which Good Friday falls and 50 hours in any other week in summer.

The overtime rates for all classes of male workers of 21 years of age and over are 8½*d.* per hour on weekdays and 10½*d.* per hour on Sundays, Christmas Day and Good Friday.

In the case of female workers, the minimum rate is 4¾*d.* per hour irrespective of age.

The whole of these rates are 5 per cent. less than those at present in force in the area.

Hertfordshire.—An Order cancelling as from November 29, 1931, the special minimum and overtime rates of wages fixed for male

workers employed in glasshouses situated in market gardens or nursery grounds or on work incidental to employment therein. The cancellation of this Order results in the rates fixed for other classes of workers in agriculture becoming applicable also to workers in glasshouses.

Lincolnshire (Holland).—An Order continuing the operation of the existing minimum and overtime rates of wages until October 29, 1932.

The minimum rate in the case of male workers of 21 years of age and over is 33*s.* 6*d.* per week of 50 hours in summer and 48 hours in winter, with in addition in the case of cattlemen and shepherds 6*s.* per week, and in the case of horsemen 10*s.* per week to cover employment (other than overtime employment) in excess of those hours. In the case of shepherds certain payments have also to be made in respect of the lambing season.

The overtime rate for male workers of 21 years of age and over is 9*d.* per hour except on Saturdays, when the rate is 10½*d.* per hour and on Sundays when the rate is 1*s.* 1½*d.* per hour.

In the case of female workers of 15 years of age and over, the minimum rate is 6*d.* per hour for all time worked.

Northampton and Soke of Peterborough.—An Order fixing minimum and overtime rates of wages to come into operation on October 25 and to continue in force until October 29, 1932.

The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 41 hours (instead of 39½ hours as at present) in the week in which Christmas Day falls, and 50 hours (instead of 48 hours as at present) in any other week in winter, 44 hours (instead of 41 hours as at present) in the weeks in which Easter Monday and Whit Monday fall and 54 hours (instead of 50 hours as at present) in any other week in summer.

The overtime rate for male workers of 21 years of age and over is 9d. per hour on weekdays and 11*d.* per hour on Sundays, Easter Monday, Whit Monday and Christmas Day.

In the case of female workers of 18 years of age and over, the minimum rate is 6*d.* per hour with overtime at 7½*d.* per hour on weekdays and 9*d.* per hour on Sundays, Easter Monday, Whit Monday and Christmas Day.

Oxfordshire.—An Order continuing the operation of the existing minimum and overtime rates of wages until March 5, 1932.

The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 39½ hours in the week in which Christmas Day falls and 48 hours during any other week within the period of operation of the Order, overtime being payable at the rate of 9*d.* per hour on weekdays and 11*d.* per hour on Sundays and Christmas Day.

In the case of female workers of 18 years of age and over, the minimum rate is 6*d.* per hour with overtime at 7½*d.* per hour on weekdays and 9*d.* per hour on Sundays and Christmas Day.

Somerset.—An Order continuing the operation of the existing minimum and overtime rates of wages until December 24, 1932. The minimum rate in the case of male workers of 21 years of age and over is 32*s.* per week of 32½ hours in the week in which Christmas Day and Boxing Day fall and 41½ hours in the week in which Good Friday falls, 50 hours in any other week in winter, 42¾ hours in the weeks in which Easter Monday and Whit Monday fall and 52 hours in any other week in summer. Provision is made for the modification of the hours of work in certain weeks where holidays are given in lieu of any of the public holidays

mentioned. The overtime rates in the case of male workers of 21 years of age and over is 9*d.* per hour except for employment on the hay and corn harvests when the rate is 10*d.* per hour. In the case of female workers of 21 years of age and over the minimum rate is 6*d.* per hour for all time worked.

Warwickshire.—An Order fixing minimum and overtime rates of wages to come into operation on October 28 and to continue in operation until further notice.

The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 52 hours (instead of 50 hours as at present) in summer and 48 hours in winter, with overtime at 9*d.* per hour (instead of 9*d.* per hour on weekdays and 11*d.* per hour on Sundays as at present).

In the case of female workers of 18 years of age and over, the minimum rate is 5*d.* per hour with overtime at 6*d.* per hour on weekdays and 7½*d.* per hour on Sundays.

Wiltshire.—An Order fixing minimum and overtime rates of wages to come into operation on December 20, 1931, and to continue in force until March 5, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 41 hours in the week in which Christmas Day falls (instead of 39½ hours as at present) and 50 hours in any other week (instead of 48 hours during the winter as at present). The overtime rate for male workers of 21 years of age and over is 8*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5*d.* per hour for all time worked.

Yorkshire (*East Riding*).—(1) An order fixing minimum and overtime rates of wages to come into operation on November 24, 1931, and to continue in force until November 23, 1932. The rates in the case of male workers engaged by the year and boarded and lodged by their employer are: foremen £84 3*s.* 0*d.* (instead of £81 12*s.* 0*d.* as at present); beastmen and shepherds £76 10*s.* 0*d.* (instead of £73 19*s.* 0*d.* as at present); waggoners £73 19*s.* 0*d.* (instead of £71 8*s.* 0*d.* as at present), with lesser rates for lads and beginners. These rates are payable in respect of a year consisting of 51 weeks of the following number of hours: in the week in which Good Friday falls, 43; in any other week in summer, 52½; in the week in which Christmas Day falls, 39½, and in any other week in winter, 48, with, in addition, in each case not more than 12 hours per week on weekdays and three hours on Sunday spent on work in connexion with the care of and attention to stock. In the case of other male workers boarded and lodged by their employer the minimum rates for a week of the same number of hours as mentioned above are: foremen, 33*s.* (instead of 32*s.* as at present); beastmen and shepherds, 30*s.* (instead of 29*s.* as at present); waggoners, 29*s.* (instead of 28*s.* as at present), with lesser rates for lads and beginners. In the case of male workers of 21 years of age and over who are not boarded and lodged by their employer, the minimum rate is 33*s.* (instead of 35*s.* as at present) per week of 39½ hours in the week in which Christmas Day falls, 48 hours in any other week in winter, 43 hours in the week in which Good Friday falls, and 52½ hours in any other week in summer. The overtime rates for all classes of male workers of 21 years of age and over remain unchanged at 10*d.* per hour on weekdays and 1*s.* per hour on Sundays, Good Friday and Christmas Day. In the case of female workers of 16 years of age and over the minimum rate remains unchanged at 6*d.* per hour with overtime at 9*d.* per hour. For

the purpose of these rates summer is defined as the period commencing on the first Monday in March and terminating on the last Saturday in October and winter as the remainder of the year.

(2) An Order fixing special differential rates of wages for overtime employment on the corn harvest in 1932, the rate in the case of male workers of 21 years of age and over who are not boarded and lodged by their employer being 1*s.* 3*d.* per hour, whilst in the case of workers who are boarded and lodged by their employer the rates are 1*s.* per hour for foremen, beastmen, shepherds and waggoners, with lesser rates for lads and beginners. In the case of female workers of 16 years of age and over the special overtime rate is 11*d.* per hour.

Yorkshire (*West Riding*).—An Order fixing minimum and overtime rates of wages to come into operation on November 24 and to continue in force until November 23, 1932.

The minimum rates in the case of male workers who are boarded and lodged by their employers are :—

Foremen.—32*s.* 6*d.* per week or £84 10*s.* 0*d.* per annum.

Beastmen and Shepherds.—31*s.* 6*d.* per week or £81 18*s.* 0*d.* per annum.

Waggoners.—29*s.* 6*d.* per week or £76 14*s.* 0*d.* per annum.

With lesser rates for other lads and beginners.

These rates are payable for a week of 48 hours in winter and 52½ hours in summer with, in addition, not more than 12 hours per week on weekdays and 3 hours on Sunday for work in connexion with care of and attention to stock.

In the case of waggoners and other horsemen and beastmen and shepherds of 21 years of age and over, who are not boarded and lodged by their employers, the minimum rate is 41*s.* 6*d.* for the same number of hours per week as in the case of those workers who are boarded and lodged.

For other male workers of 21 years of age and over the minimum rate is 35*s.* 6*d.* per week of 48 hours in winter and 52½ hours in summer.

In each case the whole of the rates given above are 6*d.* per week less than the rates at present in force.

For the purpose of these rates summer is defined as commencing on the first Monday in February instead of the first Monday in March, as heretofore.

The overtime rate for all classes of male workers of 18 years of age and over is 11*d.* per hour on weekdays and 1*s.* 1*d.* per hour on Sundays.

In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour (instead of 6*d.* per hour as at present) with overtime at 6*d.* per hour (instead of 7½*d.* per hour as at present).

Carmarthenshire.—An Order continuing the operation of the existing minimum and overtime rates of wages until November 14, 1932.

The minimum rate in the case of male workers of 21 years of age and over is 31*s.* for a 7-day week of 54 hours, with overtime at 8½*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6*d.* per hour.

Radnor and Brecon.—An Order continuing the operation of the existing minimum and overtime rates of wages until April 30, 1932. The minimum rate for male workers of 21 years of age and over is 31*s.* per week of 54 hours in summer and 50 hours in winter, with overtime at 9*d.* per hour. In the case of female

workers of 18 years of age and over the minimum rate is 5*d.* per hour, with overtime at 6¼*d.* per hour on weekdays and 7½*d.* per hour on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ended November 14, legal proceedings were instituted against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Cheshire ..	Middlewich	—	—	31 3 4	1
Gloucester..	Whitminster	*	0 10 6	20 0 0	1
Lincoln (Kesteven)	Grantham.	3 0 0	2 17 0	40 7 7	3
Salop ..	Bridgnorth	1 0 0	—	19 7 6	1
Yorks (W. Riding)	Rotherham	—	8 4 0	43 7 11	3
Denbigh ..	Wrexham .	1 0 0	—	64 4 0	1
		£5 0 0	£11 11 6	£218 10 4	10

* Dismissed under Probation of Offenders Act.

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AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1931
PRODUCE OF HOPS

PRELIMINARY STATEMENT showing the ESTIMATED TOTAL PRODUCTION of HOPS in the years 1931 and 1930, with the ACREAGE and ESTIMATED AVERAGE YIELD per STATUTE ACRE in each COUNTY of ENGLAND in which Hops were grown ; and the AVERAGE YIELD per ACRE of the TEN YEARS 1921-1930.

Counties, etc.	Estimated total produce		Acreage returned on June 4		Estimated average yield per acre		
	1931	1930	1931	1930	1931	1930	Average of the ten yrs. 1921–30
	Cwt.	Cwt.	Acres	Acres	Cwt.	Cwt.	Cwt.
Kent (East)	28,300	35,900	2,556	2,685	11.1	13.4	13.9
Kent (Mid)	30,500	48,400	3,550	3,606	8.6	13.4	13.7
Kent (Weald)	53,000	70,700	5,388	5,529	9.8	12.8	12.1
Total, Kent ..	111,800	155,000	11,494	11,820	9.7	13.1	13.0
Hants	2,800	6,800	751	867	3.7	7.9	11.5
Surrey	300	1,550	146	140	2.2	11.3	11.5
Sussex	13,300	22,600	1,461	1,680	9.1	13.4	12.2
Hereford ..	28,300	48,800	3,817	3,688	7.4	13.2	10.4
Worcester ..	11,900	17,300	1,811	1,732	6.6	10.0	10.0
Other Counties*	600	950	56	70	10.8	13.4	9.4
Total. ..	169,000	253,000	19,536	19,907	8.7	12.6	12.2

*Salop, Gloucester and Berkshire.

Note.—Although the acreage returned as under hops on June 4, 1931, was nearly 500 acres less than in 1930, the area left unpicked, estimated at 1,600 acres, was appreciably less than that, amounting to 3,500 acres, left unpicked last year. The area from which the hop crop was taken this year was, therefore, larger than in 1930. The total production of hops secured from the area picked was, however, very much less than that obtained last year, and at 169,000 cwt. shows a reduction of 84,000 cwt. Calculated on the acreage returned on June 4, this year's production gives an average yield per acre of 8.7 cwt. as compared with 12.6 cwt. in 1930, and a ten years' average of 12.2 cwt. If due allowance were made for the area left unpicked the yield per acre would be 9.4 cwt., and still very much below average.

Yields were appreciably below those of 1930 in all districts, and almost everywhere were well below average. Except for the very small area returned in Salop, Gloucester and Berkshire, where the yield per acre was above average, the best yields per acre were in Kent, although over the whole of the county the yield per acre at 9.7 cwt. was nearly 3½ cwt. below both that of 1930 and the ten years' average. In Hereford the yield per acre at 7.4 cwt. was 5.8 cwt. below that of last year and 3 cwt. below average, while in Worcester the yield per acre of 6.6 cwt. was 3.4 cwt. below both that of last year and the ten years' average. Sussex obtained a better yield of 9.1 cwt. per acre, which was nevertheless 4.3 cwt. below its 1930 yield and over 3 cwt. below its ten years' average. In the small areas of Hants and Surrey the crop was practically a failure, the yield per acre in the former county being 3.7 cwt. and the latter 2.2 cwt., compared with a ten years' average of 11.5 cwt. in both counties.

The hop-growing season this year was unsatisfactory. The weather was unfavourable, while downy mildew and insect pests were exceptionally prevalent in most districts. The quality of most of this crop was moderate.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Cheshire : Mr. J. Jackson has been appointed Farm Manager, *vice* Mr. T. Currey.

Cumberland & Westmorland (Joint Staff) : Mr. H. E. Brooks, N.D.H.,* has been appointed Horticultural Instructor, *vice* Mr. D. S. Anderson.

Mr. J. P. Edgar has been appointed Manager of the County Egg-Laying Trials, *vice* Miss R. Taylor, N.D.D., C.D.P.

Derbyshire : Mr. L. A. B. Grace, M.R.C.V.S., D.V.S.M., has been appointed Instructor in Veterinary Hygiene, *vice* Mr. A. Levie, F.R.C.V.S., D.V.S.M., F.R.S.E.

Miss K. N. Spalton has been appointed Manageress of the County Egg-Laying Trials.

Devonshire : Mr. G. D. Stevenson, Dip.Agric., N.D.A., N.D.D., has been appointed District Lecturer in Agriculture, *vice* Mr. J. E. F. Jenks, N.D.A., C.D.A.

Essex : Miss E. M. Watson, N.D.D., has been appointed Instructress in Dairying, *vice* Miss M. J. Fletcher, N.D.D.

Surrey : Miss R. M. Ware has been apppointed Manageress of the County Egg-Laying Trials.

Warwickshire : Mr. F. O. Morris, N.D.P., has been appointed Manager of the County Egg-Laying Trials.

* Wholly employed by the Council Council, but only partially on agricultural education work.

COUNTY AGRICULTURAL EDUCATION STAFFS : WALES

Glamorgan: Mr. H. H. Duckett, N.D.P., has been appointed Instructor in Poultry-Keeping.

STAFFS OF AGRICULTURAL RESEARCH INSTITUTES

Imperial Institute of Entomology

FARNHAM HOUSE LABORATORY, FARNHAM ROYAL, BUCKS

Changes having been made in the staff of the Imperial Bureau of Entomology, now known as the Imperial Institute of Entomology, the following list replaces that given on p. 777 of the issue of this JOURNAL for October, 1931.

Director	Sir GUY A. K. MARSHALL, C.M.G., D.Sc., F.R.S.
Superintendent	W. R. THOMPSON, Ph.D., D.Sc.
Entomologists	J. G. MYERS, Sc.D.
	W. H. THORPE, M.A., Ph.D.
	H. T. ROSENBERG, B.Sc.
	E. CAMERON, B.Sc.
	J. C. ROBBINS.
Field Agent	H. S. HANSON.

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Foot-and-Mouth Disease.—There has been no outbreak of Foot-and-Mouth Disease in Great Britain since early in October.

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Commercial Treaties and Arrangements : Official Handbook.—This timely publication presents a complete collection of all the treaties dealing with commerce, navigation, copyright, trade marks, etc., which applied to the United Kingdom and other parts of the British Commonwealth of Nations on May 1, 1931.

It is conveniently arranged and copiously indexed and should be a valuable work of reference for public bodies, libraries and leaders of commerce and industry.

The full title is *Handbook of Commercial Treaties, etc., with Foreign Powers.* Fourth and revised edition. Copies can be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. Price 21*s.* net.

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NOTICES OF BOOKS

The Manor Farm. By F. H. Cripps-Day. To which are added reprint-facsimiles of *The Boke of Husbandry.* An English translation of the thirteenth-century tract on Husbandry, by Walter of Henley, ascribed to Robert Grosseteste and printed by Wynkyn De Worde, c. 1510, and the Booke of Thrift, containing English translations of the same tract, and of the anonymous thirteenth-century tract Hosebonderie, by James Bellot, printed in 1589. Pp. xxxviii + 114; facsimiles not paginated. (London : Bernard Quaritch, Ltd., 1931. Price 36*s.* net.)

Although Walter of Henley's *Husbandry* has long been well-known to historical students, and a modern printed version, edited by Lamond and Cunningham, was issued in 1890, Mr. Cripps-Day has placed all

students of agrarian history under a considerable obligation by the present issue of facsimile reprints of Bellot's *Booke of Thrift* and of Grosseteste's *Husbandry*.

Bellot's *Booke of Thrift* is not to be found in the British Museum Library, and Mr. Cripps-Day informs us that he was only able to obtain the copy, from which this reprint is made, by purchasing it at the Amherst sale. It is true that the little book is only a reprint of parts of the *Hosebonderie* and of Walter of Henley's treatise, but it is nevertheless useful to be able to consult a book that has hitherto evaded the searches that have been made for it.

A comparison of the extracts from *Fleta* with the other publications enables one to realize that the farming of the sixteenth and early seventeenth centuries was still in the main carried on under the same routine as it had been for the previous 500 years. This is strongly confirmed, not only by the fact that it was thought worth while to print these treatises that had formerly existed only in manuscript, but that it was thought to be worth while to reprint *Fleta* in the seventeenth century. There is no doubt that the purpose of these reprints was not antiquarian or historical. The books were published because they were considered to be useful for practical purposes. The advice that they contained was understood to be applicable to current practice, and this impression is supported by a perusal of contemporary didactic treatises on farming. Although the books published in the early seventeenth century on agriculture contained a great deal of matter dealing with proposed new crops and proposed new methods, many of which are highly fantastic; the real practical advice that they embody is directly parallel to that contained in these reprints of the thirteenth-century treatises. We also find that the instruction given to the various manorial officers by *Fleta* is very much the same as that contained in rustic calendars of the latter part of the seventeenth century.

The instructions for ploughing for the winter and spring crops on heavy or light land are identical in both sets of books. The advice as to the time of year the cattle and sheep should be culled and the surplus sold is the same. The time at which calving and lambing should be arranged are alike because there had been no change in the system of cropping, and consequently the forage supplies dictated these considerations. Similarly with the harvest, there had been no change in the methods by which the hay was mown or the corn reaped, or in those by which the harvest was gathered.

The study of this little book will, therefore, provide the reader with a picture of the usual practice of farmers in this country during a period of nearly 500 years. It must be remembered, however, that these writers may be considered to be exponents of the high farming practice of their day, and that much of their advice may be regarded as a counsel of perfection rather than as a description of unvarying custom. Moreover, the system of farming undoubtedly varied in different parts of the country, if not very widely, then at least in a measure. The variation was not only as between two- and three-field farming, but also in the allocation of different crops to different parts of the winter field, and perhaps to different parts of the spring field. The emphasis upon the number of stock and sheep kept must also have been greater or less in accordance with the suitability of the soil and climate; and it must always be remembered that, during the period we are considering, the country was extremely sparsely populated, and that there were very wide areas that were not farmed in any sense of the word.

To obtain a complete picture of these variations it is necessary to consult manuscript sources, local records of manors and similar papers,

which will afford concrete evidence upon the variations in local practice. These papers are now being studied by a number of students, and the results are being published from time to time in monographs and essays that can be considered supplementary to the evidence provided by Mr. Cripps-Day in this book. He gives a short list of such works on page xvi.

The introduction supplied by the author is interesting and informative, particularly the part that deals with the Arabic contribution to the literature of farming.

The Vegetable Industry. By H. A. Jones, Ph.D., and S. L. Emsweller, B.Sc. Pp. viii+431. Illustrated. (London: McGraw-Hill Publishing Co., Ltd. 1931. Price 11*s.* 3*d.* net.)

This book is intended for the American high-school student, to assist him in the choice of a type of vegetable production as a possible career. The survey of modern American methods of cultivating and preparing vegetables for market will be of considerable interest to British readers, who may also derive useful information from the chapters on soil treatment and pest control.

Hortus: A Concise Dictionary of Gardening, General Horticulture and Cultivated Plants in North America. Compiled by L. H. Bailey and E. Z. Bailey. Pp. 652. Plates xvi. (London: Macmillan & Co., Ltd. Price 42*s.* net.)

The compilers of this work, who have a high reputation in British horticultural circles, have produced a comprehensive, annotated inventory of the plants (including trees, shrubs and herbaceous subjects) now cultivated in the United States and Canada. Since the majority of plants growing in British gardens are catalogued in this volume, it will be found very acceptable for ready reference by our horticulturists. Particularly valuable are the brief descriptions of botanical genera and species for the guidance of the consultant in identification, and the index, with cross references, for information on synonyms. Short notes on American cultural methods used for the commoner plants will be of interest. There are a number of excellent plates, and the whole volume is a model of clarity and compactness.

Co-operation in Danish Agriculture. By Harald Faber, with a foreword by Sir E. J. Russell, D.Sc., F.R.S. Pp. xxii+188. (London: Longmans, Green & Co. Price 9*s.*)

This volume is issued as "an English adaptation of *Andelsbevoegelsen i Danmark*, by H. Hertel," who has been intimately associated for many years with the Danish Central Co-operative Committee and the Royal Danish Agricultural Society. Mr. Faber is thoroughly conversant with both British and Danish agricultural conditions, and as might be expected, this work forms an excellent and comprehensive survey of agricultural co-operation in Denmark. Following some observations of a general historical nature, the bulk of the work is devoted to various aspects of the co-operative movement, the basis of which is that each society shall handle one commodity only, or shall concern itself with the performance of a single function.

Danish co-operation, in its modern form, has its roots in Prussia and England; the credit associations, first established in Prussia in 1769, have been the model upon which the Danish credit associations have been formed; and the principles and practices of the Rochdale pioneers in England have had a great influence on the distributive societies which, similar to the retail societies in this country, have in Denmark spread chiefly among the rural population.

The first distributive society was founded in 1866, and in 1882 Danish agricultural co-operation entered upon its second stage, when

the first co-operative dairy was opened. The basic principles of the dairy societies are compulsory delivery of all milk not required in the farm household, joint liability, pooling of returns, and open membership to all milk producers. Perhaps the most striking proofs of the success of these societies are the increase in the quantity and the improvement in the quality of butter exported.

Largely as a result of the expansion of the dairying industry and the rise of the co-operative dairies, there was a rapid increase in the pig population, and in the capacity of the farms for pig production. There was also a good deal of dissatisfaction with the existing methods of marketing pigs and, in 1887, the first co-operative slaughter-house was established. This development encountered considerable opposition in its initial stages from dealers, banks, sanitary authorities and others. Nevertheless, the number of slaughter houses and bacon factories increased and, by 1897, twenty-four had been erected.

Co-operation has not been limited to the three forms mentioned above, but includes societies for cattle breeding and horse-breeding, control societies dealing with milk-recording and food-rationing, purchase and sale societies that are similar to the requisite societies in this country, and credit, insurance and banking associations.

While each local society is an independent economic unit, there have also been formed co-ordinating bodies such as the Dairy Associations, the Central Organization of Dairy Associations, the Co-operative Wholesale Society and the Central Co-operative Committee, which are, in the main, advisory and educational bodies.

No attempt is made in this survey to offer the experience of Denmark as a solution for agricultural problems in this country, and the book gains in value as a result.

Beasts and Birds as Farm Pests. By J. Ritchie, M.A., D.Sc., F.R.S.E. Pp. xii+270. (London: Oliver & Boyd. Price 12*s.* 6*d.*)

This is a reprint of articles from the *Scottish Journal of Agriculture*, giving life histories of birds and beasts that trouble the farmer and forester, together with information regarding the most effective methods of control. The author observes that while there are numerous works on insect pests, none has previously appeared dealing with the subject of this volume. His aim has been to provide data that will enable the agriculturist to assess the comparative harmfulness of the various creatures under discussion, and to counteract their depredations on crops, livestock, pasture and woodlands. Statistics are quoted showing the extent of the losses caused by these pests, house-sparrows and rats alone being held responsible for annual damage equivalent to 8 and 10 millions sterling respectively. Seasonal migrations are noticed as they affect the farmer adversely or beneficially, and in relation to various measures for control. The most dangerous pests would seem to be creatures that have been introduced accidentally or deliberately from other places, *e.g.*, rabbits into Australia, rats and grey squirrels into this country. Special warning is given as to the grave danger attending the importation of the American Musk Rat into this country. In a few years this rodent has overrun large areas of Central Europe, causing much destruction despite all efforts to keep it in check.

The book contains a number of useful illustrations, as well as diagrams classifying birds and beasts into groups according to the particular types of crops or livestock that they attack. It should be noted that two of the Ministry's publications to which reference is made, viz., Miscellaneous Publication No. 22 (p. 59), and Leaflet No. 244 (p. 76), have now been replaced by Bulletin No. 30, *Rats and How*

to Exterminate Them, and Advisory Leaflet No. 49, *The Destruction of Rats*, respectively.

The Soil and the Microbe. By Selman A. Waksman and Robert L. Starkey. Pp. xi + 260. (New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd. 1931. Price 17*s*. 6*d*. net.)

It is of interest, at the outset, to note that this book is dedicated to Sir John Russell. The authors have used the word *microbe* as including all forms of life that exist in soil and are invisible to the naked eye. Glancing at the table of contents, one might expect the book to end at Chapter III, the first three chapters being headed "The Soil and the Plant," "The Microbe and Its Activities," and "The Soil Population and its Distribution." Chapters IV-VII, however, deal in considerable detail with biochemical transformations in soil; Chapter VIII considers the inter-relationships between higher plants and soil micro-organisms; Chapter IX deals with modification of the soil population; and the tenth and last chapter returns to the topic of microbes and soil fertility. It would appear that there was some doubt in the minds of the authors whether to adopt an intensive or an extensive view of the activities of the soil population, and the clarity of the book suffers thereby. Unevenness of planning is further shown by the fact that the carbon dioxide cycle is discussed in the foreword; nitrogen requirements of plants are first mentioned on p. 14, where it is stated that those requirements can be met by addition of inorganic substances, or of organic substances such as urea and guano. Here follows a digression concerning the origin of guano. It is only on p. 17 that the reader finds a statement that atmospheric nitrogen is largely unavailable to most plants, since they can assimilate only simple compounds. Until much later, no hint is given as to the reason for the suitability of urea or guano for supplying nitrogen to plants.

In style, the book varies from the almost avuncular to the nearly abstruse. There are several references to "powerful microscopes," but the statement occurs that "in general, bacteria are not easily differentiated morphologically." On p. 24, there is a figure of anaerobic nitrogen-fixing bacteria; on p. 29, a description of aerobic and anaerobic habits, and, on p. 31, a reference to "so-called anaerobic conditions." "An anaerobic nitrogen-fixing bacterium" is, of course, a contradiction in terms, tolerable only by usage, but it will be seen that, however excellent are the intentions of the authors, they do not make the way smooth for the beginner in soil biology.

Professors Waksman and Starkey do not accept the Russell-Hutchinson theory as fully accounting for the changes involved in partial sterilization of soil, but the alternative put forward by the authors could hardly be more vague than it is. Their view is that "partial sterilization treatments so modify the soil constituents that the supply of available foods is increased." No evidence is given concerning this important modification.

The point of chief value about this work is that it summarizes a good deal of information relating to chemical changes that take place with the soil as nidus. The microbes are thus, so to speak, short-circuited.

The book is well printed on good paper; it is illustrated by figures and diagrams. Some of the former might have gained if they had been specially prepared. Fig. 5 is unintelligible. A short bibliography is appended to the first nine chapters. Typographical errors are rare and there is a good subject-index.

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NOTES FOR THE MONTH

Sugar-Beet Pulp as a Feeding Stuff

On the Continent, it is frequently claimed that the sugar-beet districts have been enabled to carry a much larger head of cattle than would otherwise have been possible, principally because the by-products of the manufacture of beet sugar provide a valuable feeding stuff. The manufacture of sugar in this country from home-grown beet is one of our youngest industries, and it is gratifying to be able to say that the use of sugar-beet pulp as a feeding stuff, both in the molassed and plain forms, is becoming increasingly popular with British farmers. The pulp has given very good results in stock feeding, for milk as well as for beef production, and the indications are that its use will become firmly established here as it has on the Continent. As evidence of its popularity, it may be mentioned that over 81,000 tons were used by British farmers in 1930, molassed pulp and plain pulp being taken up in about equal proportions.

Special interest attaches, therefore, to a series of experiments on the value of sugar-beet pulp as a feeding stuff, carried out at three agricultural institutions. The first of these experiments was conducted at the School of Agriculture, Cambridge, and related to a comparison of the relative values of oats, molassed, dried beet-pulp and plain, dried beet-pulp for the fattening of store cattle; the second experiment was carried out at the Hertfordshire Institute of Agriculture and was designed to test the value of sugar-beet pulp for baby beef production; and the third related to an investigation at the Staffordshire Farm Institute into the feeding value of molassed beet pulp for milk production. Articles on the first two of these experiments appear in this issue of the JOURNAL (pp. 985 and 993), and an account of the third experiment will be published in the February issue.

The results of the experiments, as far as they go, are conclusive. Molassed beet-pulp and plain beet-pulp were found to be equal in feeding value to crushed oats in the rations of fattening cattle, and as between molassed pulp and plain pulp there was practically no difference in value. It is said, however, that molassed pulp is the more palatable. In the

rations for feeding dairy cows molassed pulp was found to have a value equal to crushed oats. (Plain pulp was not used in this experiment.)

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Mole Draining Demonstrations, 1932

A SERIES of four demonstrations of mole draining, to take place this winter at centres in Derbyshire, Norfolk, Cambridgeshire and Surrey, is being arranged by the Ministry in collaboration with the county agricultural education authorities concerned and the Institute for Research in Agricultural Engineering, University of Oxford.

The first demonstration of the series has been fixed to take place on January 13 and 14, on the farm of the Grassington Colliery Co., near Chesterfield, Derbyshire. The site is at Temple Normanton, in the fork of the Chesterfield-Tibshelf and Chesterfield-Mansfield main roads. The nearest railway station, Chesterfield (L.M. & S.), is about 5 miles from the demonstration centre. The second demonstration will be carried out on January 27 and 28 at the farm of Mr. Ben Burgess, Howe Hall, Norwich. The site is 5½ miles from Norwich, and may be approached from the Norwich-Bungay Road or from the Hempnall-Norwich Road. The nearest railway station is Trowse (Norwich).

Full particulars regarding these demonstrations may be obtained from the Agricultural Organizer, County Council Agricultural Institute, St. Mary's Gate, Derby, and The Director of Agricultural Education, Norfolk Agricultural Station, Sprowston, Norwich, respectively.

No definite arrangements for Cambridgeshire and Surrey have yet been made, but a further announcement with respect to the demonstrations in these counties will be made later.

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The International Institute of Agriculture

THE University of California Press has recently issued a history* of the International Institute of Agriculture, prepared by Mr. A. Hobson, who was the United States representative on the Permanent Committee of the Institute from 1922–29. The work is described as an historical and critical analysis of the organization, activities and policies of administration of the International Institute of Agriculture at Rome. In fact, it is a frank and

* *The International Institute of Agriculture.* By A. Hobson. Pp. xi + 356. (Berkeley: University of California Press. Price $3·50.)

fully documented record of the origin, organization and administration of the Institute from its foundation in 1905 up to 1929, when certain difficulties resulted in the Government of the United States withdrawing its representative from the Permanent Committee and reducing the amount of its annual contribution to the obligations stipulated in the International Convention of 1905. This Convention was amended in 1926 by a Protocol that increased the amount of the subventions payable by adhering States. The Protocol was not, however, signed by the United States Government. When, therefore, the United States Government decided to withdraw from active participation in the work of the Institute, it reduced its annual payment to the amount specified in the original Convention of 1905. The position, therefore, at the present time is that the United States, while still formally adhering to the Institute and making an annual grant towards its expenses, is not represented on the Permanent Committee, does not send delegates to the General Assembly, and takes no active part in the deliberations and work of the Institute.

The manner in which this anomalous position has arisen is clearly set out in Mr. Hobson's work. It is there shown that over a considerable period of time the United States Government pressed for reforms in the administration and conduct of the Institute. These demands formed the subject of important discussions and received support from representatives of the United Kingdom and other Governments, and in some cases at any rate received the approval of the General Assembly. Mr. Hobson, however, maintains that notwithstanding the decisions thus reached by the supreme governing body of the Institute, reforms to which the United States Government attached great importance were, in fact, not carried into actual practice.

The author concludes his work with a discussion as to the future. From this it is obvious that he does not close the door to the possibility of the United States Government renewing its full support of the Institute, provided that certain essential conditions are met. It may be hoped that the publication of this volume, which, for the first time, sets out in full detail the grounds on which the United States withdrew, may in itself assist in no small measure to bring about an improved relationship between that Government and the Institute at Rome. Whatever the future may hold in this direction, it is certain that the prestige as well as the financial resources of the Institute will both remain greatly reduced so long as the present unfortunate position continues.

Conference on Power Farming

A CONFERENCE on power farming, held at the Guildhall, Winchester, on November 13 last, was notable for having attracted a very large gathering and for the keen interest shown in the papers. It would have been unusual in a meeting of this kind if remarks of a political nature had been altogether eschewed, but, with farming hopes higher than they have been for some time, and in view of the political situation, comments were freely made. The meeting was arranged under the auspices of the Hampshire County Council Agricultural Education Committee in association with Imperial Chemical Industries, Ltd.

Four papers were read, the Chairman, Viscount Lymington, M.P., himself a "power" farmer, also contributing notes from time to time during the day. The main points in Mr. Dudley's address were: the superiority of the caterpillar type of tractor; the necessity of having for all operations large-scale implements, at least 6-furrow discs for stubble breaking; the impossibility of carrying two sets of overhead charges, therefore the desirability of a "whole-hog" policy of mechanization and the abandonment of horse traction; the superiority of petrol over paraffin as a fuel; 16-furrow disc sowing machines in a group of three; the adoption of the combine-harvester. Again, basing his remarks on his own "combine" experience on a block of 500 acres of arable land, he reckoned the capital cost of the field equipment at £5 per acre, not including dryer or grain bins. He found that costs per acre decreased as fields increased in size up to 35 acres, but that after that point there was no appreciable reduction in cost, nor would it pay to pull down walls or grub fences. Keeping to growing, harvesting and marketing charges, he could raise wheat at £3 per acre; if under a quota system he could rely on 40s. per qr. for a 4 qr. crop he would have a balance of £5 to meet rent and all other charges and farmer's profit. Much of the questioning that followed this paper was on matters of detail.

In an historical-philosophical address, Mr. Orwin tackled the question: "What would be the scope of power farming for England considered as a whole, and how far could it be made available for the individual English farmer?" On the first point, he thought it would be applicable mostly to the arable counties and would be influenced greatly by labour and weather conditions; and, in regard to labour, he thought it would take a generation to train mechanics. On the second point, he felt that most English farms were too small to carry

the cost. The size of fields was wrong and there was the great difficulty of capital sunk in equipment suitable for horse labour and unsuitable for mechanical traction. He summed up that power farming had to come or English arable farming would have to go.

Mr. Nevile spoke on "My System of Mechanized Farming after Eight Years of Experimental Work, with special reference to Sheep." He had found it necessary to forsake the established four-course system in favour of a three-course system containing two years of corn and one of fallow, or, in place of the fallow, what he calls a "renovating" crop. The crop for renovation can be sugar beet, potatoes, peas for pulling green, or anything of that general kind that can be sold for cash; or the land may be wholly or partly devoted to the provision of food for sheep and cattle. The old close-folding of sheep was not practised and, for sheep-feed, crops had to be grown on a smother system to avoid hoeing. Stock feeding in yards must in his view disappear, and he described the use of walled shelters made from bales of straw in the field where the dung could best be utilized. Pigs were a natural adjunct to his mechanized farm. Mr. Nevile's published paper, of which this is but a very brief summary, will well repay close study.

Finally, Mr. Duncan gave an account of experiments on manure distribution. Without disclosing the best makes of machine, he gave the conclusions of the Investigating Committee of Imperial Chemical Industries in favour of fertilizers in concentrated, granulated, combined form instead of finely divided.

Other aspects were also referred to, e.g., the application of power methods to stock husbandry (grass farming), and the handling of farmyard manure, but these did not emerge as major issues.

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The Farmer's Grazing Problems

FARMING is necessarily a slow business and one that does not lend itself to sudden changes, but, nevertheless, adaptability is one of the most valuable qualities that a farmer can have. There are many factors that militate against drastic change —the character of the soil and its productive limitations, the farming traditions of the district that are the results of centuries of experience, and the adopted rotation of crops that fit in well with one another and show the most economic return for expenditure. In spite of all

these, however, a careful observer will note certain gradual modifications of farming practice in almost every part of the country, and, although the progress to better things is inevitably slow, there is usually sound reason for any alteration that may be effected.

Grazing is one of the various phases of farming that are suitable subjects for modification, and in many cases farmers may with advantage consider the possibility of certain alterations in their methods. For example, temporary leys are often recommended for the East Anglian farmer as a means of conserving labour and increasing the fertility of the soil. The farmer may begin by laying down land to lucerne, thus effecting the enrichment of the soil and a higher degree of insurance against drought. He may experiment with intensive rotational grazing. He is not, however, normally short of grass in summer, and he knows that in a drought, water, and not fertilizer, is the determining factor.

He may not, therefore, whole-heartedly adopt new methods, but at least he may try the system that gives him an extension of the grazing season at both ends by the aid of artificial manures, and he will be aware of the excellent effect of nitrogen on Italian ryegrass in promoting early spring keep. He knows that the great thing is to secure a supply of grass as long as possible through the winter, for he must look to out-wintering more and more for reasons both of health of stock and farming economy. Usually, he has to rely on a pasture left rough in autumn. One that is eaten down bare in autumn and grazed intermittently throughout the winter has little stock-carrying capacity in the "dead" season, and begins growth late in spring. On the other hand, a pasture that has been manured in early autumn and left unstocked for a month or two will usually produce an abundance of fresh, green keep at a time when succulent herbage is scarce. The farmer knows that it is impracticable to manure all his winter grass, and he can best serve himself with a judicious blend of various treatments —rough pasture, bare pasture manured early and left for a month or two, and Italian ryegrass helped along by nitrogen for earliest spring keep.

Closely related to the questions of grazing and out-wintering is that of the provision of shelter for stock. The wise farmer who increases his winter grass will also consider the planting of shelter belts; in exposed situations, home-made, thatched shelters are a useful makeshift.

Pig-Keeping

THE Ministry's earlier publication on pig-keeping has now been thoroughly revised by the author, Mr. W. A. Stewart, M.A., B.Sc., and has been re-issued as Bulletin No. 32.* The Bulletin forms a useful handbook for the pig-keeper, whether about to start or already engaged in the industry. Capital required, the correct type of pig, breeding, feeding, pigsty construction and open-air pig-keeping are among the many questions fully considered. Special attention is given to the distinctive features of pig-farming in Scandinavia. The whole is in simple language, and well illustrated by means of pictures and diagrams. Detailed plans of the best types of pigsties are included. The book contains 59 pages of text, 15 illustrations and 6 detailed plans, and is attractively bound in an art-paper cover.

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Tropical Agriculture: Meeting at the International Institute of Agriculture

THE session of the Bureau of the Commission on Agriculture in Tropical and Sub-tropical Countries was recently completed at the International Institute of Agriculture in Rome. This Commission is one of those forming the International Council of Scientific Agriculture, which is the principal consultative organization of the Institute. The session was one of great importance on account of the crisis through which tropical agriculture is passing at the present time. Among those taking part were M. Leplae, Director-General of Agriculture in the Belgian Congo, who presided; Sir Wyndham R. Dunstan (London); M. Fauchère, Permanent Secretary of the Scientific Agricultural Society for Tropical Countries; Professor Heim de Balsac (Paris); Professor Maugini (Italy); Sir Arnold Theiler (Union of South Africa), Director of Veterinary Research in South Africa; Dr. Lutrario, President of the Commission on Swamp Fever, of Paris; Dr. Bisanti, representative of the International Office of Epizootics, Paris; Professor Brizi, General Secretary of the Institute; Professor G. Ray, Chief of the Bureau of Agricultural Information, and Dr. Bally, Chief of the Section of Tropical and Sub-tropical Agriculture, and a number of observers and officials of the Institute also attended the meeting. The Bureau of the Commission, in six sittings, discussed a long agenda, and arrived at important conclusions on methods of

* Bulletin No. 32, *Pig-Keeping*, obtainable through any bookseller, or from H.M. Stationery Office, price 1*s.* 6*d.* (1*s.* 9*d.* post free).

agricultural development among the native races, the cultivation of cinchona trees, bark-bearing trees, rubber trees, and studies in the subject of osteomalcia. The Commission also outlined certain leading lines of action for the Institute in regard to tropical agriculture, and discussed the resolutions of the recent Congresses of Tropical Agriculture at Seville, Antwerp and Paris.

* * * * * *

Slugs and Wheat

DURING the winter months, in a moist, open season, young wheat is sometimes severely attacked by slugs, which, if unchecked, will do great harm and may seriously impair the prospects of a good crop. Now and again such damage has been attributed to rabbits, but more often the cause remains undetected. If the farmer finds that his wheat has been attacked and obtains evidence that slugs are the cause, he should lose no time in taking measures to cope with the pest, and an "anti-slug" dressing should be broadcast over the affected area.

For the farmer who cares to try a method (discovered by the Leeds University Department of Agriculture) that has given promising results under experimental conditions, reference may be made to the spreading of a mixture of copper sulphate and kainit in the proportion of 5 lb. copper sulphate to 1 cwt. ordinary commercial kainit, the mixture being applied at the rate of 3 cwt. per acre at a time when slugs are on the surface of the ground. It is, however, not only the slug-killing power of this mixture that needs consideration, but its effect on the plants upon which it may fall, and it is preferable that, before the measure is employed on a large scale, a preliminary test should be made on a small area to see whether any burning of foliage takes place. Trials have not yet been sufficiently extensive to indicate clearly that it is invariably safe in this connexion, although it is very improbable that wheat would suffer appreciable damage. An alternative method is to broadcast ground lime (about 10 cwt. per acre) in the evening. Lime is most effective when dusted upon the ground on a damp night when the slugs are exposed, but for thorough effectiveness a second dressing may be needed.

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THE RELATIVE VALUES OF OATS, BEET-MOLASSES PULP AND DRIED SUGAR-BEET PULP FOR THE FATTENING OF STORE CATTLE*

H. E. WOODMAN, M.A., Ph.D., D.Sc., W. S. MANSFIELD, M.A., and F. H. GARNER, M.A.,
School of Agriculture, Cambridge.

THE investigations of Woodman and his co-workers at Cambridge into the digestibility and nutritive value of sugar-beet pulp have led to the conclusion that both dried sugar-beet pulp and beet-molasses pulp might be used as substitutes for cereals in the rations of fattening cattle, and that, for this purpose, 1 lb. of either kind of pulp should have a value equal to that of 1 lb. of oats. The present feeding trials were designed to test the validity of this conclusion. In the first trial, carried out during the winter of 1929–30, beet-molasses pulp was tested against crushed oats, and in the following winter, a direct comparison was made between dried sugar-beet pulp and beet-molasses pulp.

First Feeding Trial (Beet-Molasses Pulp *v.* Crushed Oats).

Experimental Animals.—For the purpose of the trial, twenty 3-year-old store bullocks of the Shorthorn type were purchased and brought to the University Farm on November 2, 1929. The animals were big-framed and in a lean condition. They were divided into two level groups of ten animals and were housed in adjoining covered yards provided with adequate feeding accommodation and a plentiful water supply. They were littered with straw on every alternate day throughout the trial. During the first week they were given a ration suitable for steers of 9½ cwt. live-weight, and were permitted to become accustomed to the new conditions and surroundings.

Weighing of Animals.—At 7 a.m. on the morning of November 7 the animals were weighed before being fed. This procedure was repeated on the mornings of November 8 and 9, the mean values of the three weighings being taken as representing the true live-weights of the bullocks. With this information for guidance, the final pairing off of the animals into two groups was completed in a satisfactory manner, the average live-weight in both groups being 9 cwt. 3 qr. 1 lb.

* It is desired to acknowledge the assistance received from Messrs. H. Hirst and T. Y. Watson (1929–30 investigation) and Messrs. F. Bennett, L. C. Couch and D. S. Hendrie (1930–31 investigation), for whom the investigations formed the subject of a thesis for the Diploma in Animal Husbandry of the University of Cambridge.

At the end of each month of feeding, the bullocks were weighed, before feeding, on three successive mornings, the mean of these weighings being taken to represent the true live-weight. It was deemed inadvisable to weigh the animals more frequently, since the consequent disturbance does not conduce to uniform live-weight increase.

Experimental Rations.—The experimental feeding period began on November 11, 1929. Both groups received a basal ration composed of 7 lb. meadow hay, 6 lb. oat straw chaff, 5 lb. silage (oats, beans and tare mixture), 2 lb. bean meal, ½ lb. decorticated cottonseed meal, and 2 lb. crushed oats. In addition, the animals in Group 1 received, per head per day, 9 lb. beet-molasses pulp, while those in Group 2 received 3 lb. beet-molasses pulp and 6 lb. crushed oats. These rations were designed to secure live-weight increase at the rate of about 2 lb. per day.

The rations were adjusted from time to time to meet the increasing demands of the animals. Full details of these progressive adjustments need not be recorded here. It is merely necessary to note that equal amounts of the basal mixture of foods were given to both groups, and that whereas the animals in Group 1 received a supplement composed wholly of beet-molasses pulp, those in Group 2 were given an equal weight of a mixture consisting mainly of crushed oats with a small allowance of beet-molasses pulp. At the end of the fourth month of feeding, for example, the basal ration for both groups had been increased to the following, per head per day: 9 lb. meadow hay, 5 lb. silage, 3 lb. bean meal, 1 lb. decorticated cottonseed meal, 1 lb. crushed oats and 1 lb. flaked maize. In addition, the Group 1 animals were receiving 15 lb. beet-molasses pulp, while those in Group 2 were receiving 2 lb. beet-molasses pulp and 13 lb. crushed oats. The scheme of rations, therefore, was such as to give a sharp comparison between the oats and beet-molasses pulp in respect of feeding value.

Method of Feeding.—The beet-molasses pulp (sugar content= 22·7 per cent.) and the oat straw chaff were thoroughly mixed together and moistened with water at the rate of 1½ pints per lb. of pulp. The mixture was allowed to stand 24 hours before feeding. Only sufficient water was added to swell and soften the pulp to a crumbly consistency, in which condition the animals consumed it readily.

The following method of feeding was adopted: at 7 a.m. both groups were given half their total daily allowance of concentrates, together with half the allowance of silage.

After this had been eaten, half of the pulp mash was fed to Group 1, while the animals in Group 2 received half of their supplementary food, consisting chiefly of oats together with a small amount of pulp. At 2 p.m. the remaining portions of these foods were given in a similar manner. In the evening, at 5 p.m., the rations of long hay were supplied to both groups. Lumps of rock salt were kept in both yards throughout the trial.

First Experimental Period (*Nov.* 11–*Dec.* 9).—The live-weight gains for both groups during the first month of the experiment were disappointing, the mean daily gains being 1·08 lb. and 1·36 lb. for the pulp animals and the oats animals, respectively. The difference of 0·28 lb. in favour of the animals receiving oats was shown, by statistical methods, to be without significance. The low gains in this period were attributed mainly to the shortness of the preliminary period, namely, a week, during which the animals were permitted to accustom themselves to the strange conditions after their arrival at the University Farm. A longer interval for settling down should probably have been allowed to elapse before bringing the animals into the experiment proper. Too much importance, therefore, should not be attached to the results of the first month of feeding.

Second Experimental Period (*Dec.* 9–*Jan.* 6).—More satisfactory live-weight increases were recorded during the second monthly period, the mean daily live-weight gains for the pulp and the oats groups being 1·79 lb. and 1·99 lb., respectively. This difference was without statistical significance.

Third Experimental Period (*Jan.* 6–*Feb.* 3).—The total exclusion of oat straw chaff from the rations in the third month, with corresponding increases in the allowance of pulp to the animals in Group 1, and of oats to those in Group 2, resulted in a mean daily increase of 2·01 lb. among the pulp animals and an average increase of 1·78 lb. per day among the oats cattle. Statistical examination of the results for this period showed that the difference of 0·23 lb. in favour of the pulp group was insignificant.

Fourth Experimental Period (*Feb.* 3–*Mar.* 3).—Extremely high live-weight gains were registered during the fourth and final month of feeding, the pulp animals in Group 1 gaining at the average rate of 2·66 lb. per day, while the oats cattle in Group 2 increased at the almost equal average rate of 2·63 lb. per day. At the conclusion of the trial, the pulp animals averaged 11 cwt. 2 qr. 16½ lb. live-weight, while the oats group averaged 11 cwt. 2 qr. 22¼ lb.

Whole Experimental Period (*Nov.* 11–*Mar.* 3).—The quantity of food, in terms of dry matter, consumed by each group over the period of the trial was almost identical, the mean daily consumption of dry matter for the pulp group being 24·59 lb. per head, and for the oats group, 24·28 lb.

Over the whole period of sixteen weeks, the mean daily live-weight increase of the pulp animals was 1·88 lb., and of the animals receiving the oats ration, 1·94 lb. Omitting the results for the first month, which, for reasons already given, cannot be regarded as entirely reliable, the mean daily gains over the last three months of feeding were 2·15 lb. and 2·13 lb. for the pulp animals and the oats animals, respectively. The close agreement between these results is noteworthy, emphasizing the conclusion that for the purpose of fattening store beasts, beet-molasses pulp and oats have equal feeding values. Statistical investigation of the results of the entire trial confirmed this conclusion.

General Observations.—A satisfactory feature of the feeding trial was the absence of any serious interference, arising from ill-health or mishap among the experimental animals, that might have detracted from the value of the final results.

Up to the end of the third month, there was little difference in the general condition of the groups; if anything, the oats cattle had the "sleeker" appearance. During the final month, however, the pulp group displayed a distinctly superior "bloom," while the animals on the oats diet deteriorated in general appearance, developing rather "dry" coats.

During the whole time the bullocks were under observation, and more especially in the earlier stages, it was apparent that while the animals being fed on the pulp ration seemed quite contented, the appetite of those that received the oats ration never appeared to be absolutely satisfied. Since the animals in Group 1 were being fed up to capacity, it was impossible to increase the amount of food given to the oats cattle in Group 2 without defeating the objects of the experiment.

The bullocks were slaughtered locally and a complete record of the carcass weights and killing percentages was obtained. In this regard, also, the two groups displayed remarkable similarity. The average carcass weights of Groups 1 and 2 were 51 st. 10·4 lb. and 51 st. 12·5 lb., respectively, the killing percentages working out almost equally at 57·86 per cent. and 57·07 per cent. for the two groups.

The meat produced from both groups was of good quality and flavour. There was no marked difference between the two

groups in this respect, save that the fat from the pulp-fed groups was slightly softer than that of the animals on the oats diet. The butchers, however, considered this feature quite unimportant so far as the marketing of the meat was concerned, and it was concluded that beet-molasses pulp, even when included in the finishing ration to the extent of 15 lb. per head, per day, is capable of producing meat equal in quality to that produced from oats-fed cattle.

Conclusions (*First Feeding Trial*).—(1) Beet-molasses pulp has been proved to be equal in feeding value to crushed oats when fed, pound for pound, to mature fattening cattle.

(2) As much as 15 lb. of beet-molasses pulp was fed per head per day, with successful results, and without causing "scouring." The effect of a ration containing a similar allowance of oats was slightly laxative, owing, in all probability, to the relatively high oil content of the oats.

(3) No marked differences were observed between the carcasses of the bullocks fed on beet-molasses pulp and those fed on oats. The meat in both cases proved of satisfactory quality and flavour.

Second Feeding Trial (Beet-Molasses Pulp *v.* Dried Sugar-Beet Pulp).

General Arrangement of Trial.—Twenty Lincoln Red Shorthorn steers were purchased for the purposes of the experiment and brought to the University Farm on October 9, 1930. They had all been bred and reared on the same Lincolnshire farm, and on this account formed a suitable group of animals for the trial. They averaged somewhat under two years of age, were in fair store condition, and bore evidence of good conformation and breeding.

On arrival the animals were divided into two level groups of ten each, and were housed in the covered yards that had been used in the previous year's trial. Management in respect of feeding and weighing was substantially the same as that described above for the 1929–30 trial. The first experimental period began on October 18, at which stage the average live-weight of the animals in both groups was 7 cwt. 3 qr. 12½ lb. Both groups received a basal ration composed of 14 lb. good meadow hay, 5 lb. oat and tare silage, 2 lb. crushed oats and 2 lb. decorticated ground nut cake. In addition, the animals in Group 1 received 6 lb. beet-molasses pulp, while those in Group 2 were given an equal weight of dried sugar-beet

pulp. The rations were designed to secure live-weight increase at the rate of about 2 lb. per day.

Both kinds of pulp were fed in the moistened condition. In the case of the molasses pulp (sugar content = 18·4 per cent.), 1 pint of water was used per lb. of pulp; for the ordinary dried-beet pulp (sugar content = 3·3 per cent.) rather more water, namely, 1½ pints, was required per lb. The moistened pulp was allowed to stand 24 hours before feeding.

On account of slight "scouring," which had persisted from the time of arrival of the bullocks, it was decided on October 28 to introduce a small allowance of undecorticated cotton cake into the rations, ½ lb. of decorticated ground-nut cake being replaced by an equal weight of cotton cake. This slight modification of the feeding had the desired effect of eliminating "scouring" from both groups of animals.

With the progress of the experiment, the rations were adjusted to meet the increasing demands of the animals. In the main, the changes consisted in a continuously increasing replacement of meadow hay by beet pulp, although towards the end of the feeding trial it was found desirable to introduce up to 2 lb. of flaked maize into both rations. At this stage, both groups of bullocks were receiving, per head per day, 6 lb. meadow hay, 5 lb. silage, 2 lb. crushed oats, 2 lb. flaked maize, 1½ lb. decorticated ground-nut cake and 1 lb. undecorticated cotton cake. In addition, the animals in Group 1 were receiving 15 lb. of beet-molasses pulp, and those in Group 2 15 lb. of dried sugar-beet pulp per head per day.

It was noted throughout the experiment that when the bullocks receiving the ordinary beet pulp were feeding up to their maximum capacity for food consumption, those receiving beet-molasses pulp could have dealt with a heavier ration.

Health of Animals during Feeding Trial.—A satisfactory feature of the previous year's trial was the absence of disturbing factors arising from ill-health or mishap among the animals under experiment. The present trial, however, was not attended by such good fortune. At the time of their arrival on the farm, several of the bullocks were found to be suffering from ringworm, but by careful treatment this disease was completely eradicated and the general appearance of the bullocks greatly enhanced.

There were two cases of illness, however, which had a serious effect on the course of the experiment. Within seven days of the beginning of the first experimental period, bullock No. 2 (dried sugar-beet pulp group) developed pathological symptoms.

The animal was isolated and, following a period of unsuccessful treatment, was slaughtered on December 9, when it was shown to have been suffering acutely from Johne's disease.

During the second experimental period (Nov. 14–Dec. 12) it became necessary to remove bullock No. 4 (also of the dried sugar-beet pulp group) from the experiment. This animal was slaughtered on December 15, and was found also to be suffering from Johne's disease, though less acutely than in the case of bullock No. 2.

In view of these two cases of disease among the animals in Group 2, it is satisfactory to record that an examination of the viscera, after slaughter of the animals at the end of the trial, failed to reveal any traces of infection in the remaining eighteen experimental animals.

First Experimental Period (*Oct.* 18–*Nov.* 14).—The average live-weight gains during this month were 1·85 lb. per head per day by the molasses-pulp-fed group, as compared with 2·45 lb. for the group receiving ordinary beet pulp. This difference is statistically significant, and is of interest in view of the results of the previous year's trial, when it was also found that the bullocks receiving beet-molasses pulp made relatively poor progress during the first month of feeding. It would appear that beet-molasses pulp is a "poor starter" for store bullocks at the beginning of the fattening period, possibly because it differs very markedly, on account of its high sugar-content, from the diet to which the bullocks have been accustomed while being fed as stores. The result emphasizes the recommendation already put forward, namely, that a longer interval for settling down and for becoming accustomed to the experimental diet should be allowed before bringing the animals into the experiment proper.

Second Experimental Period (*Nov.* 14–*Dec.* 12).—The average gains in this month were 2·43 lb. per head per day for the animals in Group 1 (beet-molasses pulp) and 2·61 lb. for those in Group 2 (ordinary beet pulp). The difference of 0·18 lb. per head per day in favour of the ordinary beet pulp was not significant statistically.

Third Experimental Period (*Dec.* 12–*Jan.* 9).—During this month, the bullocks receiving beet-molasses pulp averaged 2·15 lb. per head per day live-weight increase, while those receiving ordinary beet pulp showed an average daily gain of 2·18 lb. The difference again was insignificant.

Fourth Experimental Period (*Jan.* 9–*Feb.* 6).—The average daily gains for this month were: Group 1 (beet molasses

pulp), 2·14 lb. per head per day, and Group 2 (ordinary beet pulp), 1·73 lb. per head per day. The difference of 0·41 lb. in favour of the beet-molasses pulp seems striking, but the gains of the individual animals in this period showed such a margin of variation that the value of P was 0·3.* The difference, therefore, was without statistical confirmation. Throughout this month, the animals in Group 2 displayed a dull appetite, although the full ration was always consumed.

Fifth Experimental Period (*Feb.* 6–*Mar.* 6).—During this final month, the animals in Group 1 made the noteworthy average gain of 2·68 lb. per head per day as compared with 2·33 lb. by the bullocks in Group 2. Again the difference was not significant (P= 0·48). At the completion of the trial, the ten animals in Group 1 averaged 10 cwt. 2 qr. 17·9 lb. live-weight and the eight bullocks remaining in Group 2, 10 cwt. 3 qr. 12·5 lb.

Whole Experimental Period (*Oct.* 18–*Mar.* 6).—As in the previous year's trial, the mean daily consumption of dry matter over the entire trial was almost identical for the two groups of animals, being 22·57 lb. per head for Group 1 and 22·61 lb. for Group 2.

For the whole course of the experiment, the average live-weight gains were : Group 1 (beet-molasses pulp), 2·25 lb. per head per day, and Group 2 (ordinary beet pulp), 2·32 lb. per head per day. The small difference in favour of the ordinary beet pulp was without significance. If the results of the first experimental period are excluded, on the grounds that the animals were unaccustomed to the conditions of the experiment, the average gains become : Group 1 (beet-molasses pulp), 2·35 lb. per head per day, and Group 2 (ordinary beet pulp), 2.21 lb. per head per day. Again the small difference is insignificant.

Carcass Results and Quality of Meat.—At the end of the feeding trial, there was a noticeable " bloom " on the bullocks in both groups. During the 36 hours' fast before slaughter, the interesting observation was made that the mean loss in weight by the molasses-pulp-fed bullocks amounted to 86 lb. per head, while that by the ordinary pulp-fed animals was only 66 lb. per head, a difference which may possibly be attributed to the swifter passage of beet-molasses pulp through the alimentary tract. The mean killing percentages, based on the fasted live-weight, were remarkably close for both groups,

* i.e., the odds are only 7 to 3 in favour : to be significant they should be at least 20 to 1.

namely. 56·0 per cent. for Group 1 and 56·4 per cent. for Group 2.

The carcasses from both groups were of very satisfactory quality. The animals were thickly-fleshed, and in most cases the meat was well-marbled and of good colour. The suet-fat was abundant and there was no indication of the over-white condition of the fat, which is stated by certain investigators to occur in bullocks that have been fed chiefly on beet pulp. Joints from bullocks in both groups were sampled, but it was not possible to detect any marked differences in texture and flavour.

Conclusions (Second Feeding Trial).—(1) Beet-molasses pulp and dried sugar-beet pulp have been shown to be equal in feeding value when used, pound for pound, in the fattening of store bullocks.

(2) The allowances of beet pulp have been increased up to 15 lb. per head per day in the finishing rations with highly satisfactory results in respect of rate of gain of live-weight. No undue "scouring" was caused by these heavy allowances of beet pulp.

(3) No marked differences were observed between the carcasses of the bullocks fed on beet-molasses pulp and those receiving ordinary beet pulp. In both cases the carcasses were of satisfactory quality.

Note.—The combined results of the 1930 and 1931 feeding trials enable the conclusion to be drawn that dried sugar-beet pulp, beet-molasses pulp and oats are of equal feeding value in the fattening of store cattle.

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SUGAR-BEET PULP FOR BABY BEEF

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WITH reference to the Ministry of Agriculture's scheme for testing sugar-beet pulp, the section that dealt with its use for fattening young animals of the "baby-beef" class was carried out on the farm of the Hertfordshire Institute of Agriculture during the two seasons 1929-30 and 1930-31. In both seasons, two well-balanced groups of animals, six in each group, were arranged for the test proper, while several others were fed on carefully controlled rations and their live-weight gains were recorded. Altogether 33 beasts have been recorded

in the two seasons concerned. In the earlier period the test was between molasses pulp and crushed oats, and in the second period between the two types of pulp. Except for the weighing of foods and animals the conditions were practically the same as those on an ordinary commercial farm.

Season 1929-30 : Pulp v. Oats.—In this year twelve animals, six of each sex, were available for the comparative test. They were arranged in six pens of two animals each, three pens to be fed on the pulp ration and three on the oat ration : the total initial live weight was the same in both groups. Later, one of the heifers had to be discarded, so, to keep the groups as closely comparable as possible, its " pair " in the other group was omitted from the records.

In drawing up the rations the standards used were those tentatively suggested in this JOURNAL* in November, 1928. Experience has shown that these standards are extremely useful as a guide provided that, as in using any other feeding standards, the rations so compiled are adjusted up or down according to the results actually obtained. Any changes considered necessary for the animals in one group were balanced by similar changes in the other in order to keep the consumption of food the same in both groups. The foods were weighed out weekly to the individual pens, and, to provide a still more strict control of the consumption, peat moss was used as bedding instead of straw.

For the first two months the rations consisted of silage (oats, beans, tares, wheat), oat straw, concentrates and crushed oats or sugar-beet pulp. Thereafter, silage and oat straw were replaced by " seeds " hay. At the end of four months, owing to slight digestive trouble with beasts on the oat ration, 4 lb. of potatoes per head per day were given to all, replaced later by a few mangolds ; to allow for this the pulp or oats were reduced by 1 lb. daily. Examples of the rations actually used are given in Table I.

TABLE I.—*Examples of rations used.* *Lb. per head daily*

Live-weight (cwt.)	4	6		8		10	12
		A	B	A	B		
Silage	10	15	—	15	—	—	—
Oat straw ..	1½	2	—	4	—	—	—
Hay	—	—	7	—	8	9	10
Concentrates† ..	4	5	5	5	6	6	5
Oats or pulp ..	4	6	6	7	7	10	11

A = Ration when silage was used. B = Ration when hay was used.

†*Concentrates.*—Maize-gluten feed 1 part. Oats 1 part.
Palm-kernel cake 1 „ Middlings 1 „
Decort. earth-nut cake 1 „

* *Super English or Baby Beef :* J. Hunter-Smith and H. W. Gardner.

It will be observed that it was left to the increasing amounts of oats or pulp to widen the albuminoid ratio as the age and live weight increased: the concentrates were not altered in composition. The pulp was fed moist after soaking for about 18 hours.

All the beasts were weighed weekly on the same day between 9 and 9.30 a.m., and the weights served as the basis of rationing for the subsequent week. With young animals, many of which have been reared by hand, such frequent weighings are not disturbing as, after the first time or two, they are easily led by halter to the weighbridge.

Results Obtained.—The close correspondence between the two groups each of five beasts is clearly shown by the following figures.

Total increase in live-weight to end of	*Pulp group*	*Oats group*
First month	175 lb.	140 lb.
Second month	441 ,,	420 ,,
Third month	637 ,,	616 ,,
Fourth month	784 ,,	721 ,,
Fifth month	1,162 ,,	1,085 ,,
Sixth month	1,442 ,,	1,491 ,,

The average daily live-weight increase for the six months was, in the pulp group 1·72 lb., in the oats group 1·77 lb., the difference being trifling. The variation for individual animals was from 1·58 lb. to 2·04 lb. in the pulp group, and from 1·42 lb. to 2·33 lb. in the oats group. It is obvious, therefore, that much larger groups of animals would have been necessary to detect any differences between the two rations. Mention has already been made of one respect in which the pulp ration was superior: whereas slight digestive trouble leading to constipation was experienced in the oats group no such trouble arose at any time with the pulp. This, however, was readily overcome by the supply of a few potatoes or mangolds.

Grading of Carcasses.—After slaughter, all the carcasses were graded by an official grader, and, although with such small groups of animals little significance could be attached to any differences, it is of interest to record his chief conclusions. In the pulp group, four carcasses were marked select and one prime; in the oats group, three were select and two prime, so that in this respect also the differences were slight. In every case, the fat of the animals was of good colour.

Other Animals on the Pulp Ration.—In addition to the beasts described above, three other steers, for which no pairs

were available, were fed on the same pulp rations. Two were beef-bred twins starting off at just over 3 cwt. live weight: for the six months period these averaged 1·9 lb. daily increase —a very satisfactory rate of growth for animals of this size. The other steer was dairy-bred, starting at 8½ cwt.: this averaged 2·17 lb. daily for the same period, also an extremely satisfactory result. At the end of the six months it was consuming 10 lb. hay, 5 lb. concentrates, 10 lb. pulp, 4 lb. potatoes as its daily ration.

Season 1930-31: Molasses Pulp v. Plain Pulp.—In this season the arrangement was the same, 12 animals being divided evenly into two groups, each consisting of three pens of two beasts. Again, however, one animal had to be discarded, owing to an accident, at the end of the second month. In addition to these two main experimental groups there were two pens, one of three young animals (not above 2½ cwt. at start) to be fed on plain pulp, and another of three older ones (between 5 and 7½ cwt.) to receive molasses pulp.

The rations were purposely kept as simple as possible and with a very small proportion of imported food. Examples are given in Table II.

TABLE II.—*Rations used* 1930-31. *Lb. per head per day*

Live-weight (cwt.)	3	5	7	9
Hay	4	6	7	10
Concentrates* ..	3	4	5½	5
Pulp	3	5	7	9

* *Concentrates.*—Midds. 3. Bran 1. Decort. earth-nut cake 1, plus a small amount of chalk, bone flour and salt.

In this trial no digestive trouble was experienced at any time, but it was observed that the molasses pulp was consumed much more readily than the plain. Indeed, the consumption of the latter was a limiting factor in the feeding, for, while the beasts on molasses pulp could have been pushed on, those on the plain pulp found the rations as set out in Table II the maximum which they could consume. For the sake of the experimental comparison the others had to be limited to the same amount.

Results.—Over a period of six months the average daily gain in the two groups was exactly the same, viz., 1·65 lb. As will be seen from the figures given below, however, there were considerable variations from month to month and from individual to individual.

TABLE III.—*Average daily live-weight increase (lb.)*

Month	1st	2nd	3rd	4th	5th	6th	Aver-age	Animal Worst	Animal Best
Plain pulp	1·62	1·58	1·65	1·79	2·05	1·2	1·65	1·33	1·91
Molasses ,,	2·08	1·33	1·41	1·62	1·45	2·0	1·65	1·25	2·16

The average live-weight increase was somewhat below the previous year, mainly, perhaps, because the beasts were of a lower average quality. That the rations were not defective is shown by the performances of the best animals in the two groups. It is again evident that a very large number of beasts would be necessary to detect the difference, if any, between the feeding values of the two types of pulp. From the practical point of view, however, it is of importance that the molassed pulp is more relished by the cattle, making possible the consumption of higher amounts and therefore, possibly, higher live-weight gains.

The Other Groups.—The pen of three young animals on plain pulp also had a satisfactory record, averaging 1·57 lb. per head per day for six months. The three older beasts on molassed pulp averaged 1·98 lb. daily, although the six months included a period of definite setback owing to the application of the tuberculin test.

General Conclusions.—For practical purposes crushed oats, molasses pulp and plain pulp may be considered of equal feeding value and to be interchangeable. They have been used in quantities as high as 10 lb. per day for a 10-cwt. beast, *i.e.*, they have provided quite 50 per cent. of the total feeding value (starch equivalent) of the ration. No trouble was experienced with either type of pulp, but the molassed pulp was undoubtedly more palatable and could, in practice, be fed in higher amounts than the plain pulp. In the case of all the rations employed, first-class carcasses have been produced and top prices obtained.

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THE CULTIVATION OF LETTUCE UNDER GLASS

WITH SPECIAL REFERENCE TO VARIETIES RESISTANT TO DOWNY MILDEW

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Introduction.—Within recent years, the cultivation of lettuce under glass has been greatly extended in the Marton district of Lancashire, and many commercial glass-house growers in that area now regard the crop as their most important source of revenue during the spring months.

In the rotation under glass, the lettuce crop comes after winter-flowering Chrysanthemums and before the spring-planting of tomatoes. In some instances, where houses are not used for Chrysanthemums, lettuces are planted immediately after clearing tomatoes in the autumn, and it is then the usual practice to grow two successive crops of lettuce before the houses are required for tomatoes.

Lettuces grown under glass are in fairly constant demand during the winter and spring months, but the call is usually greatest at the Christmas, Easter and Whitsun holiday periods. Hence growers usually adjust sowings so that the bulk of their crops may be ready at these times. For the Christmas trade, seed is sown in the Marton area towards the end of August; for the Easter demand, there is a sowing in the middle of October; while seed sown in the early part of December will normally produce a crop ready for cutting at Whitsun. For the first crop, the seed is usually sown thinly on a fine seed-bed out of doors; the second sowing is made in a cold frame; and, for the last crop, it is customary to sow thinly in the glass-houses.

The seedlings are kept as hardy as possible and, when the third and fourth leaves have begun to develop, are transferred to permanent quarters in borders in the houses, being set 6 to 7 in. apart, according to variety. In other cases, seedlings are first transplanted at 2 in. apart and replanted later at the greater distance. This method entails increased labour, but has considerable merit, and the finest crops seen by the writer have been produced in this way.

In preparing the borders for seedlings, it is essential to provide a well-worked soil and a fine tilth; the more efficient mechanical soil cultivators have proved eminently satisfactory for this purpose.

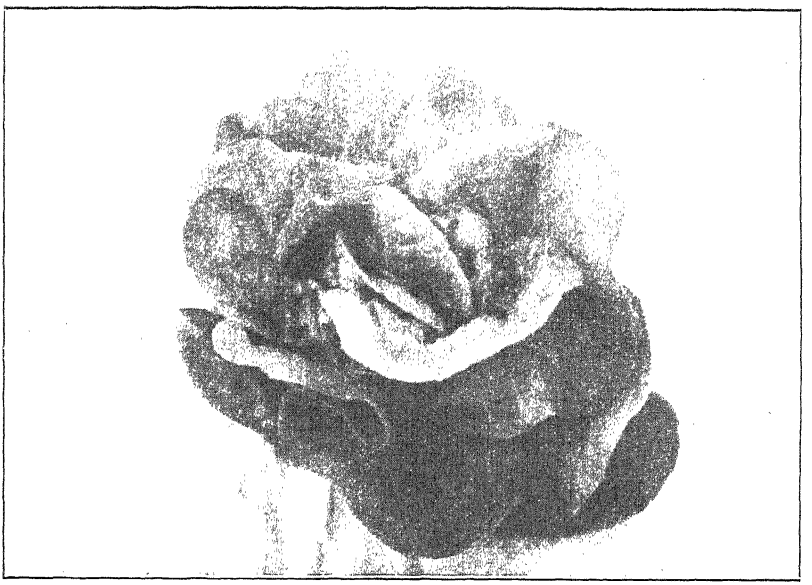


FIG. 1.—Central Market Forcing Lettuce.

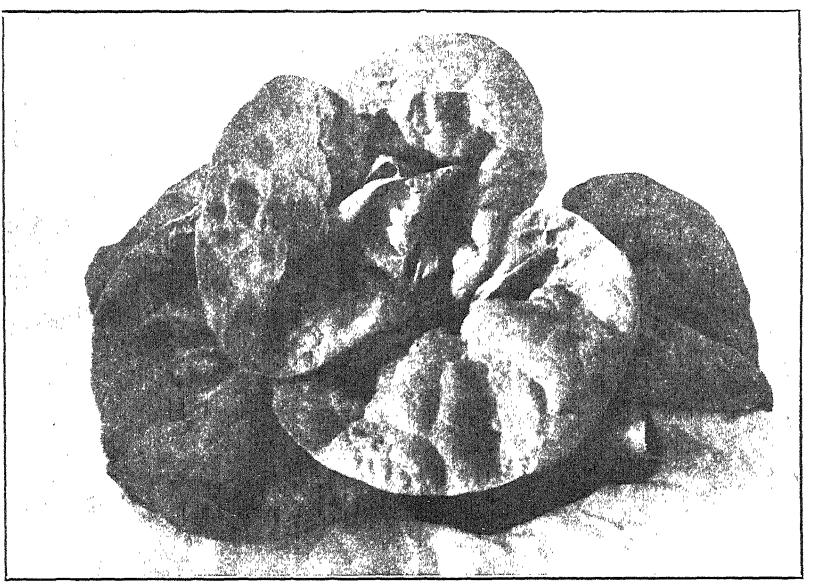


FIG. 2.—Golden Ball Lettuce.

CULTIVATION OF LETTUCE UNDER GLASS.

To face page 998.

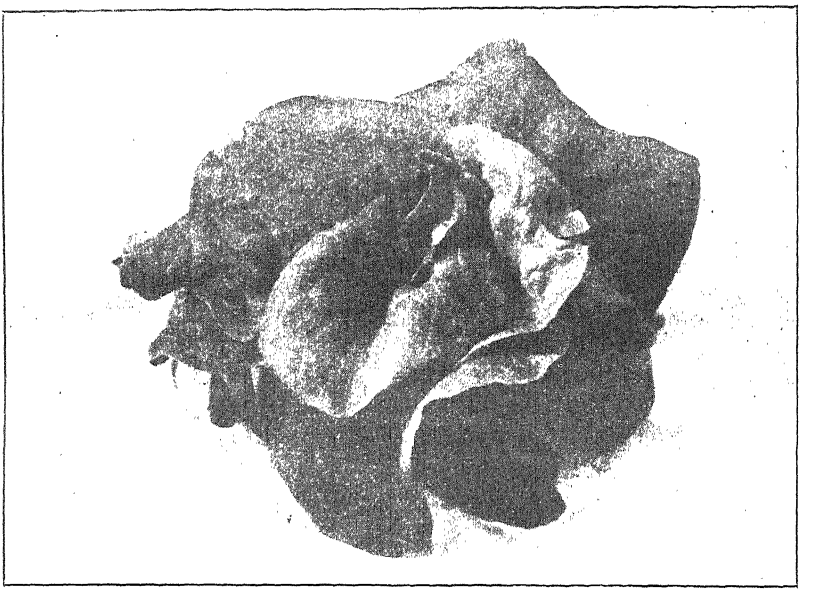


FIG. 3.—Loos Tennisball Lettuce.

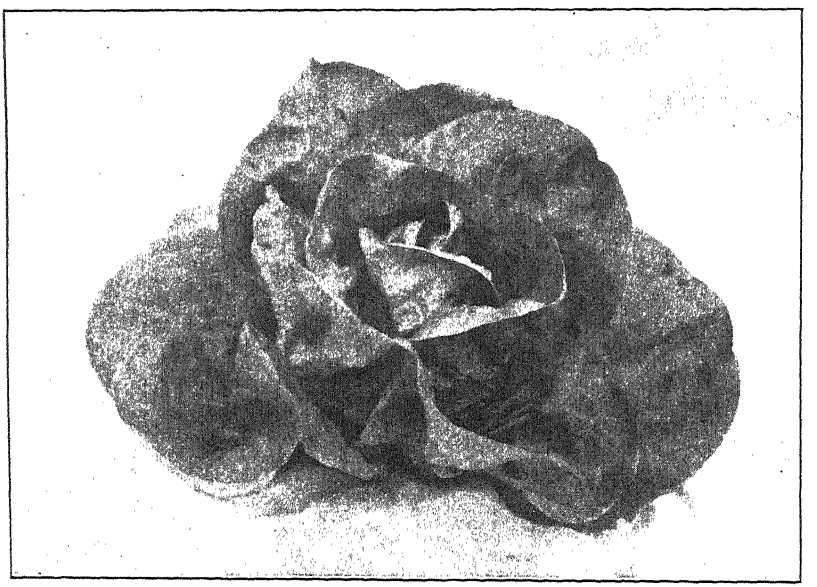


FIG. 4.—May Queen Lettuce.

Manurial Requirements.—Lettuces under glass are not exacting in respect of manures, and the residues left from the tomato crop are often found to be fully adequate for their requirements. In houses situated on land of a heavy character, however, or where the soil has become exhausted, or where newly broken-up land is used, it has been found that an application of partially-decayed farmyard manure, supplemented by a liberal dressing of quick-acting bone manure (*e.g.* dissolved bones), has had a markedly invigorating effect on the crop.

Varieties and Their Resistance to Downy Mildew.—Until recently, the variety of lettuce, grown almost exclusively for forcing under glass in the Marton district, was that known as French Frame Forcing, but while, in many respects, this is a very serviceable variety, it has under certain conditions proved highly susceptible to Downy Mildew (*Bremia Lactucae*). Through this disease, growers have latterly suffered heavy losses, amounting, sometimes, to over 50 per cent. of the crop.

As no very effective measure could be devised for controlling the disease in large glass-houses, the Lancashire Agricultural Education Committee decided to institute trials to find out whether certain varieties of lettuce, widely-grown in France and Holland, that had proved highly-resistant to Downy Mildew, would prove equally resistant when grown under the conditions obtaining in the Marton district.

The varieties included in the trials and the sources of the seed were as follows :—

French Frame Forcing	English seed (Grown as control)
Golden Ball (see Fig. 2)	English seed
Loos Tennisball (see Fig. 3) (Gotte à graine blanche de Loos)	French seed
Rosy Spring (see Fig. 5) (Rosée printanière)	French seed
Central Market Forcing (see Fig. 1) (Gotte à châssis à graine noir)	French seed
May Queen (see Fig. 4)	Dutch seed

With the co-operation of two experienced commercial growers, Mr. J. E. Cardwell and Mr. J. Leeming, it was possible to establish reasonably large-scale trials under glass in Marton, conducted under normal market-garden conditions, while a trial was also carried out on a smaller scale at the Lancashire County Council Horticultural Station, Hutton, near Preston.

Observations on the Trial Crops : *Mr. Cardwell's Trial.*—At this centre, the seed was sown under glass on December 15,

1930, and germination was entirely satisfactory. In January, however, patches of Downy Mildew were noticeable in the seedlings of the French Frame Forcing, Golden Ball, and Central Market Forcing varieties, although infection did not spread very much and the variety Golden Ball appeared to out-grow the disease. The seedlings were planted out on January 26, 1931, at an average distance of 7 in. apart in each direction, great care being taken to select for planting only healthy and clean-rooted seedlings. A few failures that occurred after transplanting were replaced, and the young plants grew away normally. Towards the end of March, a slight attack of Downy Mildew was observed in French Frame Forcing, and, by the first week in April, the disease had extended to Central Market Forcing and Golden Ball, and became more severe later in the month. A certain number of plants were also attacked by Botrytis Rot and a few by insect pests.

The results from this trial are shown in Table I :—

TABLE I.—MR. CARDWELL'S TRIAL

Name of variety	Number of plants in trial	Percentage of plants			Average wholesale price per dozen
		Attacked by Downy Mildew	Destroyed by Botrytis, etc.	Sold	
					s. *d.*
French Frame Forcing ..	520	23	5	72	1 6
Golden Ball ..	520	15	6	79	1 6
Loos Tennisball ..	520	—	6	94	1 6
Rosy Spring ..	520	—	8	92	1 6
Central Market Forcing ..	520	16	5	79	1 3
May Queen ..	520	Trace	8	92	2 0

Mr. Leeming's Trial.—The seed of the five varieties tested at this centre was sown on December 22, 1930 ; on account of the limited quantity of available seed of the Dutch strain of May Queen, this variety was not included in the trial at this centre. The seed of the five varieties sown germinated very evenly, and the seed beds were entirely free from disease. Transplanting was carried out on February 3, 1931, and the young plants made good progress until the second week in March, when Downy Mildew was noticed on French Frame Forcing. It developed so rapidly that, by the first week in April, it was estimated that over 70 per cent. of this variety

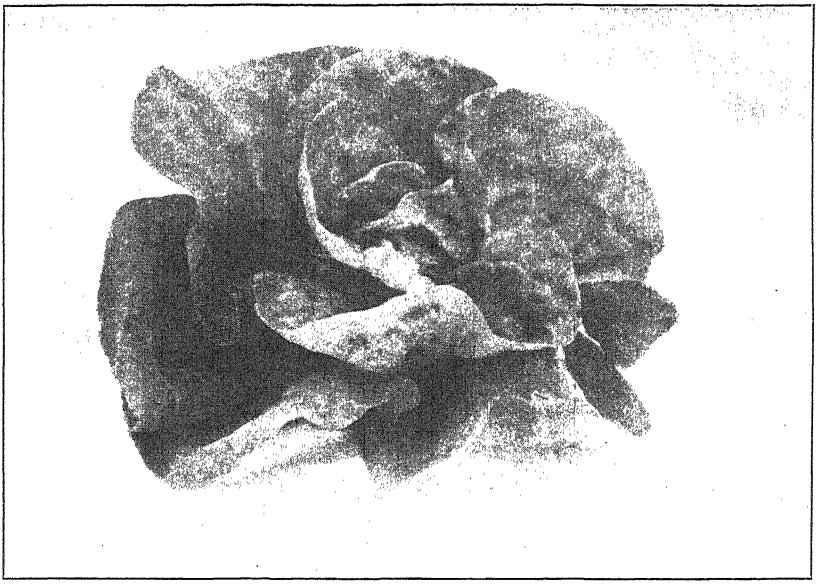


Fig. 5.—Rosy Spring Lettuce.

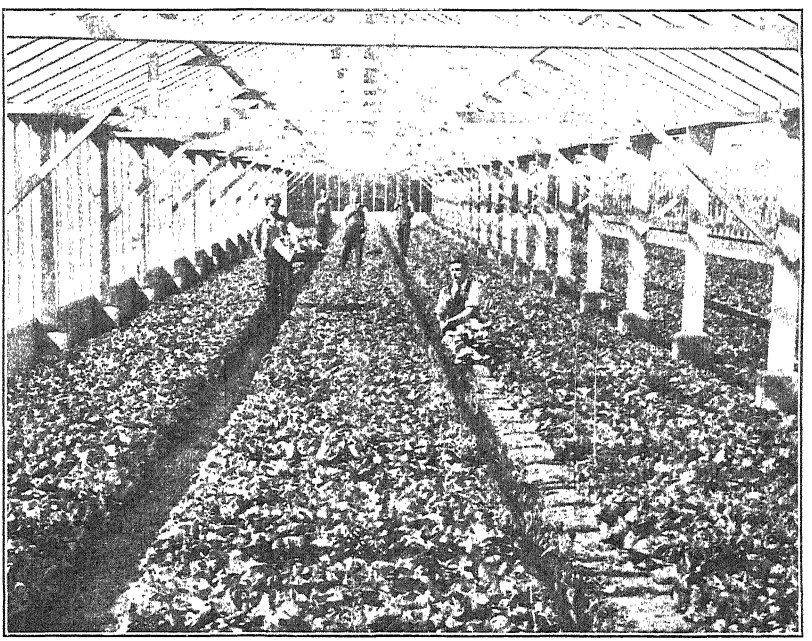


Fig. 6.—A batch of Loos Tennisball Lettuce in a Marton nursery.

Cultivation of Lettuce under Glass.

To face page 1100

was attacked. As this attack threatened an appreciable monetary loss to the grower it was decided to clear out the whole of this variety, and it was removed on April 7. The varieties Golden Ball and Central Market Forcing also showed a number of plants attacked by the disease, but, as in the Cardwell trial, the varieties Loos Tennisball and Rosy Spring were quite free from any trace of Downy Mildew, although a few of each variety were attacked by Botrytis Rot.

The results from this trial are shown in Table II :—

TABLE II.—MR. LEEMING'S TRIAL

Name of variety	Number of plants in trial	Percentage of plants			Average wholesale price per dozen
		Attacked by Downy Mildew	Destroyed by Botrytis, etc.	Sold	
					s. d.
French Frame Forcing ..	432	Over 70	- -	—	Removed April 7
Golden Ball ..	432	7	6	87	1 6
Loos Tennisball ..	432	---	7	93	1 8
Rosy Spring ..	432	---	10	90	2 0
Central Market Forcing ..	432	10	4	86	1 3

Discussion of the Results.—As the trials were carried out in commercial establishments and under ordinary market-garden conditions, it was not found convenient to replicate the plots of each variety. It should also be borne in mind that the data represent the results of one season's trials only. After making due allowance for these limitations, however, it is significant that, at both centres, the varieties Loos Tennisball and Rosy Spring were entirely free from Downy Mildew. Further, the variety May Queen was markedly resistant, since less than 1 per cent. of the crop was seen to be attacked by this disease, while the varieties French Frame Forcing, Golden Ball and Central Market Forcing showed varying degrees of susceptibility.

Marketing and Returns.—Notwithstanding that better market returns were realized for May Queen and Rosy Spring than for Loos Tennisball, it is the last-named variety that appealed most to those commercial growers who visited the trials, on account of its fine habit of growth, attractive appearance, and good travelling qualities; and it is now being grown extensively in the district. (See Fig. 6.)

Characteristics of the Varieties.—Owing to the rather loose and spreading habit of May Queen in its early stages of growth, and to the relatively larger head that it produces, it is considered that this variety should be planted out 8 in. apart. A peculiarity of the Loos Tennisball variety, noted in the trials, was a tendency to produce a certain number of aberrant seedlings, each bearing a cluster of leaves that developed into plants of little commercial value. This, however, is not a serious drawback, since such plants can invariably be detected in the seed bed and be discarded when transplanting.

Horticultural Station Trials.—In addition to the commercial trials described above, a supplementary trial, on a smaller scale, was carried out at the Horticultural Station, Hutton ; but, through the lack of available space, the control variety French Frame Forcing, was not included in this trial. The seed was sown in boxes on December 22, 1930, and, after germination took place, the boxes were placed in cold frames. Perfectly healthy seedlings were produced in abundance, and these were planted out in the glass-house border on February 18, 1931. The young plants made vigorous growth during the first few weeks, but, by the first week in April, both Botrytis Rot and Downy Mildew had put in an appearance. As in the other trials, however, the varieties Loos Tennisball and Rosy Spring remained free from Downy Mildew. In this trial Rosy Spring produced only indifferent heads, whilst the slight susceptibility of May Queen to Downy Mildew, previously observed in Mr. Cardwell's trial, was again evident.

The results of this trial are shown in Table III :—

TABLE III.—HORTICULTURAL STATION TRIAL

Name of variety	Number of plants in trial	Percentage of plants			Average wholesale price per dozen
		Attacked by Downy Mildew	Destroyed by Botrytis Rot	Sold	
					s. d.
Golden Ball ..	132	12	7	81	1 9
Loos Tennisball ..	143	—	11	89	1 9
Rosy Spring ..	143	—	20	80	1 6
Central Market Forcing ..	143	14	11	75	1 9
May Queen ..	154	2	13	85	2 0

Possibilities in the Selection of Stock for Seed.—Apart from the varieties of lettuce mentioned in this report, the writer, in

1929–30 and 1930–31, inspected a small stock of plants in the possession of Mr. J. W. Cardwell, Stockydale Nursery, Marton, who, for the past two years, has saved seed from plants originally selected by him from a bed of French Frame Forcing. Careful examination showed that the plants were entirely free from Downy Mildew, although grown in the middle of a bed of another variety of lettuce that was badly infected with it. It is safe to say that the stock held by this grower possesses considerable promise. It is, therefore, suggested that growers of lettuce under glass could do useful work by selecting for stock from which to save seed any plants that show a special degree of resistance to this most troublesome and costly disease.

In conclusion, the writer desires to acknowledge his indebtedness to Mr. J. E. Cardwell, Bankdale Nurseries, Marton, and Mr. J. Leeming, Southview Nurseries, Marton, for their valued co-operation in carrying out the trials; also to Mr. E. Holmes Smith, B.Sc., Adviser in Mycology and Agricultural Botany, The University, Manchester, for corroboration in recording the number of plants in the trials attacked by Downy Mildew and Botrytis Rot, as well as for the photographs of the different varieties of lettuce. He also has pleasure in acknowledging the assistance of Mr. C. W. Pannevis, Zaadtelt & Zaadhandel, Delft, Holland, who kindly sent him the sample of seed of the Dutch strain of May Queen.

* * * * * *

MARKETING NOTES

National Mark Eggs.—A noteworthy feature of the year's operations has been the comparative abundance of supplies of home-produced eggs during the late autumn, which is the season of short supply. This has, no doubt, been largely due to mild weather conditions, but it is partly attributable to the tendency of producers to extend their hatching season last spring in order to reap the benefit of the higher prices normally obtaining in autumn and winter.

In order to help the smaller producers, a number of Women's Institutes have made arrangements for members' supplies to be forwarded to, or collected by, the local National Mark Packing Stations. It is hoped to extend this system to other areas.

As from January 1, 1932, *all* National Mark labels applied to containers of eggs will be required to bear a code mark indicating the date of packing. Hitherto, this requirement has only applied to the larger cases, but it is now extended to cover one-dozen and half-dozen cartons. Authorized packers will, however, be relieved of the necessity of recording the actual date of packing on the check slips that are inserted in National Mark egg cases, as the code-dating system is now sufficiently well known to both wholesalers and retailers to make this unnecessary. Copies of the code-dating calendar for the year 1932 may be obtained on application to the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

In November, the total output of the National Mark Egg Packing Stations was returned as 19·5 million eggs, of which 14·4 million were packed under the National Mark. This represents an increase of 66 per cent. over the quantity packed under the Mark in November, 1930. During the first eleven months of the year, the National Mark output was 47 per cent. greater than during the corresponding period of 1930.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during November, 1930, and November, 1931, and the number of sides graded and marked for the four weeks ended December 19, 1931, were as follows :—

			Number of sides
		LONDON	
Weekly average	..	November, 1930	2,026
,, ,,	..	,, 1931	2,001
Week ended	..	,, 28, 1931 ..	2,046
,, ,,	..	December 5, 1931 ..	2,120
,, ,,	..	,, 12, 1931 ..	2,227
,, ,,	..	,, 19, 1931 ..	3,115
		BIRKENHEAD*	
Weekly average	..	November, 1930	996
,, ,,	..	,, 1931	377
Week ended	..	,, 28, 1931 ..	428
,, ,,	..	December 5, 1931 ..	422
,, ,,	..	,, 12, 1931 ..	373
,, ,,	..	,, 19, 1931 ..	344
		SCOTLAND*	
Weekly average	..	November, 1930	1,999
,, ,,	..	,, 1931	1,165
Week ended	..	,, 28, 1931 ..	1,311
,, ,,	..	December 5, 1931 ..	1,301
,, ,,	..	,, 12, 1931 ..	1,468
,, ,,	..	,, 19, 1931 ..	2,135
		TOTAL LONDON SUPPLIES (All sources)	
Weekly average	..	November, 1930	5,021
,, ,,	..	,, 1931	3,543
Week ended	..	,, 28, 1931 ..	3,785
,, ,,	..	December 5, 1931 ..	3,843
,, ,,	..	,, 12, 1931 ..	4,068
,, ,,	..	,, 19, 1931 ..	5,594
		BIRMINGHAM	
Weekly average	..	November, 1930	464
,, ,,	..	,, 1931	843
Week ended	..	,, 28, 1931 ..	877
,, ,,	..	December 5, 1931 ..	901
,, ,,	..	,, 12, 1931 ..	917
,, ,,	..	,, 19, 1931 ..	1,056
		LEEDS	
Weekly average	..	November, 1931	500
Week ended	..	,, 28, 1931 ..	494
,, ,,	..	December 5, 1931 ..	512
,, ,,	..	,, 12, 1931 ..	543
,, ,,	..	,, 19, 1931 ..	557
		BRADFORD	
Weekly average	..	November, 1931	478
Week ended	..	,, 28, 1931 ..	468
,, ,,	..	December 5, 1931 ..	435
,, ,,	..	,, 12, 1931 ..	443
,, ,,	..	,, 19, 1931 ..	417
		HALIFAX	
Weekly average	..	November, 1931	122
Week ended	..	,, 28, 1931 ..	106
,, ,,	..	December 5, 1931 ..	108
,, ,,	..	,, 12, 1931 ..	129
,, ,,	..	,, 19, 1931 ..	156

* Sides consigned to London.

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

The heavy decrease of supplies of meats of all kinds continued to be a noticeable feature of the markets during November.

Nevertheless, the figures for National Mark beef for the London area continued to improve. The number of sides of home-killed beef graded and marked in London during the week ended November 21 last (2,488) was the highest figure reached since the week ended April 25, 1931, and with that exception was the highest since January, 1931. The Scottish figures for that week (1,368) were the highest since June 1 last.

Owing to an increased demand from London, Birkenhead wholesalers showed more readiness to have sides graded and marked. The "Buy British" campaign appears to have had an effect in stimulating the demand for National Mark beef.

In Birmingham, the weekly average number of sides graded and marked for the month of November (843) constituted a record. The weekly average figure for November, 1930, was 472. Not only is the scheme spreading to a wider area in the Birmingham district, but a number of butchers who ceased to offer beef for grading when the difficulties with the wholesale trade arose are now returning to the scheme. Increasing interest is also being shown in the Ministry's scheme for the sale of cattle on a grade and dead-weight basis.

The situation in Leeds, Bradford and Halifax remains steady.

Members of the Inter-Departmental Committee on the National Mark Beef Scheme visited Birmingham, Leeds and Bradford during November to hear oral evidence from the trade.

National Mark Dressed Poultry.—The position arising out of the present rate of exchange for sterling gives the home poultry producer a valuable opportunity to extend his share of the home market, which, in recent years, has been largely dependent on imported produce for best-quality supplies. The main factor in the success of the foreign exporter has been the regular delivery of large consignments of carefully-graded produce, which is frequently sold before arrival. A visit to the wholesale markets shows that the technique of breeding and conditioning poultry for the table has reached a high standard in the exporting countries.

It is a hopeful sign that many poultry farmers in this country realize that a lower rate of egg production may be desirable if it results in an improvement in the quality of the eggs, and that much more attention should be paid to the type of poultry reared in order to improve the conformation and quality of the dressed carcass.

The possibilities that exist in this country for developing the dressed-poultry trade are certainly very great, and the National Mark Dressed Poultry Scheme, launched in June, 1930, makes the organized marketing of this commodity on the basis of standard grades a practical proposition. Many of the initial difficulties have been overcome by the packing stations established under the scheme, and it only remains for producers to meet the needs of existing National Mark packing-stations, or to encourage the development of new poultry-packing enterprises, in order to secure the position in the home market that should be theirs. Continuity of supply is a vital factor in modern marketing, and producers can assist in this matter by extending the breeding season and hatching a quantity of suitable chickens during the month or two before the normal breeding period commences. The steady demand experienced for National Mark dressed poultry, and the number of inquiries received by authorized packers, indicate that the distributive trade fully appreciates the standardized grading and packing and the weight declaration required by the scheme.

National Mark Schemes for Fruit.—The year 1931 is the fourth successive year in which National Mark schemes have been in operation for home-grown fruits. That the schemes are destined to become a vital factor in the distribution of home-produced fruit is recognized by all sections of the fruit trade. Progress, although subject to slight fluctuations, has been steady.

Growers.—The insistence on close attention to detail in grading and packing under the schemes is causing growers to investigate the need for similar precision in the production side of their undertakings. As an educational factor, the schemes continue to have a profound effect on the efficiency of production, as well as on the technique of grading and packing generally. They have brought growers to realize, as nothing else could make them, that the markets of to-day require fruit of first quality and that the marketing of fruit of low and even medium-grade is rapidly becoming unprofitable. Improvement in the standard of production is, in fact, the first step towards participation in the schemes.

Salesmen.—Progress in securing the co-operation of salesmen continues. The Ministry's advertisements in the fruit trade journals and the wide distribution of the Ministry's Marketing Leaflet No. 25 have had a favourable effect. The output of National Mark fruit, however, is largely confined to those salesmen who have a connexion for high-grade products, and it seems a likely development of the future that National Mark specialists will be established in every market. Almost all salesmen handling National Mark fruit have been very helpful to the Ministry in the administration of the scheme, and some are actively pressing growers of quality-fruit to enrol.

Retailers.—Organized retailers continue to give their full support to the schemes and have been commendably tolerant of mistakes that inevitably occur in establishing schemes of this kind. Their only complaint is that supplies of National Mark fruit are far from sufficient.

Advertising.—In addition to advertising the schemes in the trade papers, extensive advertising of National Mark products to attract the attention of the public has been carried on by the Ministry throughout the year.

The coloured posters of tomatoes and cucumbers and soft fruits that were displayed by the Ministry on the E.M.B. frames attracted favourable notice in all parts of the country.

National Mark products, including fruits, have been exhibited at a large number of agricultural and fruit shows, and in special National Mark shops in the larger cities and towns. These shows and shops have enabled the public to see and handle the products. In some instances, registered growers themselves have organized shop and show displays, and two have organized grading and packing demonstrations.

Films illustrating the grading, packing and marketing of tomatoes, cucumbers and strawberries have provided a popular and interesting form of advertising; a film showing apple grading and packing is approaching completion.

The Ministry's propaganda has clearly stimulated public interest in National Mark fruits, and the effect appears to be working back through the distributive machinery to the grower.

Supplies.—The demand for all National Mark fruits continues to exceed the supplies, although a steady increase in supplies is observable. A substantial improvement in the standard of production is essential, particularly in the case of apples, before the markets can receive a reasonable proportion of National Mark fruits. Propaganda for "Better Production" is being intensified.

Contraventions.—It is a matter for satisfaction that the number of contraventions that have necessitated reference to the National Mark Fruit Trade Committee has only been thirteen, and in view of the large number of growers enrolled this represents an improvement on the year 1930.

It is now almost a standard practice for the Ministry's Inspector who discovers a contravention to purchase a package for return to the grower after detailed examination at the Ministry. This method of dealing with contraventions has met with remarkable success. Many growers now realize that the Ministry's market check on packing is a valuable service and many letters of thanks have been received.

Supervision of Grading and Packing Operations by Growers.—The importance of meticulous care in grading and packing, and the need for strict supervision by growers are being emphasized on every possible occasion. The improvement here is general, but gradual. In the case of large-scale growers, the training of workers in the precise methods of picking, grading and packing required in the National Mark schemes is a matter of difficulty. The experience of growers who have succeeded in this shows that it is well worth while.

Labels.—The design of all National Mark fruit labels is being revised, to allow for greater prominence of the grower's name, mark or number. Arrangements are also being made for authorized packers to make their own arrangements for the printing of National Mark labels subject to payment of a nominal charge to the Ministry and the Ministry's approval of the designs.

New Schemes.—In response to inquiries from the Evesham and Pershore districts, the possibility of applying the scheme to plums has been explored. Discussion at meetings of representative plum

growers at Evesham and Pershore indicated that substantial support would probably be forthcoming if a practicable scheme was devised. Detailed investigation was carried on during the plum season, and a draft scheme is being prepared for introduction in 1932, if funds permit. No other new schemes are contemplated at present.

National Mark Scheme for Plums.—Progress has been made with the formulation of a draft National Mark Scheme for plums and a tentative schedule of varieties, grades and packages has been prepared. The varieties proposed for inclusion in the scheme are as follows :—" Rivers Early Prolific," " Czar," " Purple Pershore," " Pershore Yellow Egg," " Belle de Louvain," " Victoria," and " Monarch."

A marketing leaflet will be issued in due course indicating the main features of the scheme, which, if funds permit, will be brought into operation in 1932.

National Mark Canned Fruit and Vegetables.—In a report to the Ministry on the features of the 1931 pack of canned fruits and vegetables under the National Mark, based on the examination of over 1,000 samples, the Director of the Campden Research Station remarks on the progress made by the industry in 1931. The Director speaks in his report of " British canned foods building up a reputation on the home and overseas markets based on something more than novelty and patriotism." The chief constituent of that " something more " is undoubtedly the standardized quality resulting from grading and processing in accordance with the requirements of the National Mark Scheme.

The latest estimates of the progress of the English fruit and vegetable canning industry in recent years include the following figures :—

Year	*No. of firms engaged*	*No. of canning factories*	*Estimated approximate output cwt.*
1928	25	30	132,000
1929	27	32	272,000
1930	35	40	570,000
1931	49	56	Figures not yet available

The total pack of fruits and vegetables in 1930 was estimated at 34,200,000 cans, of which more than 11,000,000 were packed under the National Mark. The remainder includes a large output of cans of produce, such as canned preserved peas, not at present eligible for the National Mark.

National Mark Cider.—The following applicants have now been authorized under the scheme, the last-named being a bottler :—

Teign-Cider Co., Netherton, Devon, and Tower Bridge Road, London, S.E. 1.
Dowdens, Ltd., Netherton, Devon, and 39-41 Bermondsey Square, London, S.E. 1.
Daniel Phelps & Son (Harold J. Phelps), Tibberton, near Gloucester.
Heavysege, Ltd., 50 Seaview Road, Wallasey, Cheshire.

The total number of authorized packers is now 68, consisting of 42 manufacturers and farm cider-makers, 2 associations of farm cider-makers and 24 bottlers. One further application for enrolment is under consideration.

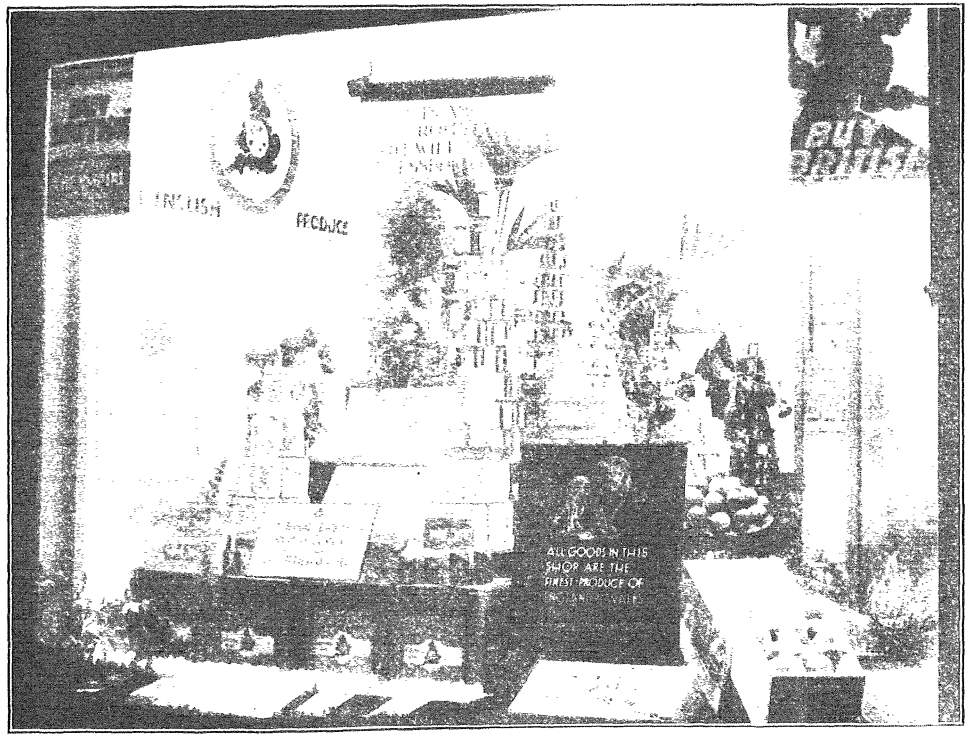
The report of the Government Chemist on the analyses of samples taken by the Ministry's inspectors during the past summer shows that a satisfactory standard of quality was attained by National Mark cider during the period under review.

National Mark Wheat Flour.—Judging from the issue of official labels, the demand for National Mark wheat flour during the last quarter of 1931 shows a decided increase over the demand during the corresponding quarter of 1930. This is no doubt due in some degree to the broadening of the channels of distribution, by the enrolment during the year of more than 60 additional firms as authorized re-packers, controlling twice that number of retail shops. There has also been a large increase in the number of retailers handling National Mark flour pre-packed by authorized millers. One of the largest firms of grocers in the country, controlling some hundreds of shops, decided in November, in response to their customers' wishes, to replace their usual blend by National Mark flour.

It has always been a feature of the scheme that where an authorized miller or re-packer takes up the scheme with enthusiasm, he is able to increase his sales rapidly, while firms who are "prepared to supply National Mark flour only when the demand arises" are at a disadvantage in securing orders. Sales by individual firms now range up to well over 200 bags per month. In some districts, particularly in the North, National Mark *Yeoman* has been selected as the basis of a self-raising flour and found to give satisfaction.

Tests carried out at the National Bakery School with National Mark *Yeoman* of the 1931 crop from ten different sources throughout the country show that the flour has fine bread-making qualities. The flour gave easy working and uniform results without the addition of lard or oil recommended in the previous year.

To face page 10(b).



Empire Marketing Board Shop, Lord Street, Liverpool. Window display of produce of England and Wales, November 16–30, 1931.



Part of the interior of the Empire Marketing Board Shop, Lord Street, Liverpool, while occupied by display of produce of England and Wales, November 16–30, 1931.

Marketing Demonstrations.—Demonstrations were staged during December at the Birmingham Fatstock Show held at Bingley Hall, Birmingham, from November 28 to December 3, and at the Smithfield Show held at the Agricultural Hall, London, from December 7-11. The demonstrations at each Hall comprised the Organization of Potato Marketing and a display of National Mark beef.

H.R.H. The Duke of York, accompanied by H.R.H. The Duchess of York, visited the Ministry's stand at Birmingham; and H.R.H. Prince George spent some little time inspecting the Ministry's exhibit during his tour of the Smithfield Show.

National Mark and Home Produce Displays.—As announced in the JOURNAL for December, a display of produce of England and Wales was staged by the Ministry in conjunction with the National Farmers' Union at the Empire Marketing Board Shop, 27-29 Lord Street, Liverpool, during the period November 16-30. The shop attracted large numbers of visitors, particularly business men, and the number of trade inquiries considerably exceeded those received at previous shops of this nature. Over 15,000 samples of National Mark and other home products were sold in the fortnight. The accompanying photographs illustrate the nature of the display.

As a result of seeing the National Mark egg display on the Ministry's Stand at the Dairy Show, Agricultural Hall, London, in October last, the Directors of the Birmingham Dairy Company suggested to the Ministry that a similar display might be staged in the window of their shop premises in New Street, Birmingham. The services of one of the Ministry's Exhibition Staff were loaned for dressing the window, and the display commenced on November 16, to coincide with the inauguration of the "Buy British" campaign. The Company reports that considerably increased sales of National Mark eggs resulted from the display, which was retained in the window for three weeks instead of the one week originally intended.

Publicity for National Mark Produce.—In connexion with the "Buy British" campaign, which was inaugurated by the Empire Marketing Board on November 16, the Minister and Parliamentary Secretary received representatives of the Press on November 19 and emphasized the important place that home agricultural produce should take in the campaign. Attention was drawn to the special importance of the National Mark standards of quality, and to the value of the National

Mark as a ready means of identifying the home origin of the commodities to which it is applied.

Prominence was given in many newspapers to the reference to the National Mark made by the Prince of Wales in his broadcast appeal on November 16, in which he said: "I regard the introduction of the National Mark for agricultural produce as an important and promising move in the right direction."

On December 11, the Parliamentary Secretary addressed a meeting of farmers and others in the Town Hall, Basingstoke, convened by Mr. J. G. de Jetley-Marks, and over which Viscount Lymington, M.P., presided. The Parliamentary Secretary referred to the opportunities open to producers in this country in view of recent events, and the strong "Buy British" sentiment now prevailing, and stressed the advantages afforded by the National Mark movement for turning this preference to good account. He dealt at some length with the wide scope for development offered by eggs and table poultry, and urged those present to give special support to the marketing under the National Mark of these two commodities. It was announced that Mr. de Jetley-Marks intended to establish at Basingstoke a combined packing station for National Mark eggs and dressed poultry.

In order to sustain interest in the National Mark in towns in which National Mark Shopping Weeks were held in 1930, special seasonable articles were supplied to a number of newspapers circulating in the towns concerned. In addition, an article dealing with the National Mark and Christmas fare was circulated to the Press generally.

During December, National Mark beef was again advertised in Birmingham and Yorkshire newspapers and in the *Meat Trades Journal*. Egg producers were approached—by means of advertisements in poultry journals—on the question of supporting the authorized packing stations. National Mark fruit was advertised in distributors' journals, flour in grocers' and bakers' journals, malt extract in the medical and chemists' journals, and canned vegetables in the catering Press and in *The Horticulturist*. An advertisement in women's journals urged the buying of National Mark products for Christmas.

As an instance of the increasing tendency on the part of authorized packers to supplement the advertising of National Mark products undertaken by the Ministry, a recent example might be quoted, viz., that of an authorized packer of National Mark flour in Essex who, in addition to distributing to shopkeepers supplies of a window poster incorporating the Prime

Minister's appeal to "Buy British whenever you can," issued handbills advertising his own brand of National Mark flour. Local publicity efforts of this nature undoubtedly do much to stimulate interest in the National Mark movement.

In connexion with a Christmas Festival organized by the Corporation of Morecambe and Heysham, a Manchester flour packer provided ½ cwt. of National Mark flour for a monster Christmas pudding, the ingredients for which were supplied by the various countries of the Empire.

Lectures to women's organizations in Birmingham, on the subject of National Mark beef, have aroused so much interest that a letter has been issued to over 700 women's organizations in that city offering lectures on the wider aspects of the National Mark scheme, with particular reference to its importance in the "Buy British" campaign.

Orange Books on Marketing.—Evidence that the Ministry's "Orange Books" on the marketing of agricultural and horticultural produce are becoming more and more appreciated by farmers, distributors, economists, students, etc., is afforded by the fact that within the past twelve months over 60,000 copies have been sold. Altogether, approximately 144,000 copies have been sold, and six numbers have been sold out. Several other numbers are nearly sold out—only a few copies remaining of Economic Series No. 12 (Marketing of Pigs) and No. 20 (Marketing of Cattle and Beef). As it is not the Ministry's intention to reprint any of the reports, those who desire to obtain copies of particular issues to make up a set would be well advised to order them without delay. The reports of which copies are still available are as follows :—

Economic Series	*Price 6d. each net ; prices in brackets include postage.*
3	The Economic Resources of Canada in relation to British Food Supplies. (8*d.*)
7	Wool Marketing. (7*d.*)
8	Agricultural Credit. (7*d.*)
9	Marketing of Potatoes. (9*d.*)
10	Egg Marketing. (9*d.*)
11	Marketing of Poultry. (9*d.*)
12	Marketing of Pigs. (8*d.*)
13	Markets and Fairs. Part I—General Review. (8*d.*)
14	Markets and Fairs. Part II—Midland Markets. (9*d.*)
15	Fruit Marketing. (9*d.*)
16	The Fluid Milk Market. (9*d.*)
18	Marketing of Wheat, Barley and Oats. (9*d.*)
19	Markets and Fairs. Part III—Northern Markets. (9*d.*)
20	Marketing of Cattle and Beef. (9*d.*)

Economic Series	*Price 6d. each net; prices in brackets include postage.*
21	Preparation of Fruit for Market. Part I—Apples, Pears, Plums and Strawberries. (9*d.*)
22	Marketing of Dairy Produce. Part I—Cheese. (9*d.*)
23	Markets and Fairs. Part IV—Eastern and Southern Markets. (9*d.*)
24	Preparation of Fruit for Market. Part II—Gooseberries, Currants, Cherries, Raspberries, Loganberries, Tomatoes, Cucumbers and Grapes. (9*d.*)
26	Markets and Fairs. Part V—Welsh Markets; Part VI—London Markets; Part VII—Final Review. (9*d.*)
27	The Sugar-Beet Industry at Home and Abroad. (1*s.*)
28	Marketing of Honey and Beeswax. (9*d.*)
29	Marketing of Sheep, Mutton and Lamb. (10*d.*)
33	The Agricultural Marketing Act, 1931. (8d.)
34	Organization of Potato Marketing. (9*d.*)

The Reports may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, or through any bookseller.

Sugar-Beet.—*Sugar Production*, 1931-2. — According to returns made by the beet-sugar factories operating in Great Britain the total quantities of beet-sugar manufactured during November, 1931, and the corresponding month in 1930 were :—

November, 1931..	2,256,415 cwt.
November, 1930..	2,419,704 „

The total quantities of sugar produced during the two manufacturing seasons to the end of November were :—

1931-2	3,530,485 cwt.
1930-1	4,728,884 „

Crop Data.—The following weekly averages have been compiled from data supplied to the Ministry in respect of beets delivered to the beet sugar factories in England and Wales during the current manufacturing season in the four weeks ended December 12, inclusive. Averages for the corresponding period of the previous season are shown for comparison :—

Week ended	*Average weight of roots* (grammes)		*Average sugar content* (per cent.)		*Average weight of sugar per root* (grammes)	
	1931	1930	1931	1930	1931	1930
November 21	387	507	17·3	17·4	67	88
„ 28	387	495	17·0	17·2	66	85
December 5	394	521	16·8	16·8	66	88
„ 12	403	509	16·7	16·6	67	85
Season to date	395	506	17·4	17·0	69	86

Rates of Advances under the British Sugar Industry (Assistance) Act, 1931.—Below are given the average prices

of raw cane sugar certified by the Minister for the periods specified, and the corresponding rates of advances under the above Act per cwt. of beet sugar of a polarization exceeding 98 degrees :—

Certified average price per cwt. of raw cane sugar		*Rate of advance per cwt. of 98° beet sugar*	
Fortnight ended :—	*s. d.*	Week of manufacture :—	*s. d.*
November 28	6 $4\frac{3}{4}$	December 5	1 3
December 5	6 $6\frac{1}{2}$	,, 12	1 3
,, 12	6 9	,, 19	1 0
,, 19	6 $9\frac{1}{2}$	,, 26	1 0

Isle of Man.—The Agricultural Produce (Grading and Marking) Act, 1931, of the Isle of Man was ratified on November 9. Under this measure, which follows closely the lines of the Agricultural Produce (Grading and Marking) Act, 1928, of the United Kingdom Parliament, the Isle of Man Board of Agriculture is empowered to make regulations prescribing grade designations for any kind of agricultural produce and defining the quality indicated by such designations, and also to make regulations prescribing a mark to represent any statutory grade designation.

The Act contains special provisions, similar to those in force in this country, relative to the marking of preserved, cold-stored and chemically stored eggs, and also to the registration of premises used for the cold storage or chemical storage of eggs.

Every local authority in the Isle of Man is required to enforce the provisions of the Act, and prosecutions for offences under the Act may be instituted by the Board of Agriculture, the local authority, or any officer of the police.

Germany : Grain Trade Society.—The Deutsche Getreide-Handels Gesellschaft m.b.H. (German Grain Trade Society, Ltd.) was formed early in 1926, as a semi-official trading company, in consequence of legislation passed for the regulation of grain prices. It operates over the whole of Germany, but principally in the grain-growing centres in the east and north, and in marketing centres like Hamburg and Berlin. The main function of the Society is to regulate the market in the interests of price stability, and one of its methods is to advance money to the farmer so that he can hold his stocks until a favourable selling opportunity occurs. The organization has a capital of Mk. 15,000,000 and, in addition, enjoys a credit from the Reich of Mk. 30,000,000 given at $1\frac{1}{2}$ per cent., without security, and repayable on April 1, 1934. The Society handles both German and imported grain, and is largely concerned with rye. At different times, it has operated in connexion with the quotas of domestic wheat ground in German mills, the organization of a potato-flakes trade, and the control of fodder-rye and barley.

By an Emergency Decree of August 6, 1931, the Society was invested with the right to issue negotiable warehouse certificates on grain in store. The Society is authorized to provide the necessary space for storage, and to mix grain of similar quality, but is required to keep separate the grain that it buys or owns in its capacity as a grain-dealing firm, and the grain it handles for storage under the warehouse plan. The warehouse certificates that it issues serve as collateral security for bank credits to the owners of the grain.

It is intended to replace this provisional decree by warehouse legislation and by an Act establishing official grain standards. Preliminary

standards for German grain have been devised by the Government, but it is not anticipated that these will play an important part in this year's crop movement.

The Government has made plans for the purchase and temporary storage of several hundred thousand tons of rye through the Society, apart from wheat and other commodities, and is assuming the guarantee for possible losses through fluctuations in prices or other decreases in the value of the grain stored. The storage operations are, it is stated, to be only sufficient to relieve seasonal pressure on the market.

Germany : Agricultural Publicity. An association has recently been established in Germany to advise all sections of German agriculture on their advertising and on the preparation of technical publicity material. This association, the Deutsche Landwerbung, G.m.h.b. (German Agricultural Publicity, Ltd.), has been set up jointly by the German Agricultural Society, the German Agricultural Council and other interested bodies, and its capital has been provided by the leading agricultural organizations. The intention is not to work at a profit, but to conduct its business as cheaply as possible, consistent with covering expenses and interest on capital.

So far, the chief activities of this new organization have been in the direction of advising the interests that have been conducting the "Eat More Fish," "Eat More Sugar," etc., campaigns, but it is intended that the association shall itself prepare and conduct such campaigns in the future.

The association is, in effect, an agricultural advertising agency, and all agricultural concerns, both individual and co-operative, and industries processing agricultural produce that wish to carry out special publicity on up-to-date lines, can make use of its services. It is also prepared to accept business from undertakings desirous of promoting sales of their products among agriculturists.

Argentina : Regulation of the Importation of Eggs.—In continuance of the policy embodied in an earlier Decree issued by the Provisional Argentine Government regarding the marking of eggs, both imported and home produced, a further Decree, dated March 31, 1931, has been issued by the Argentine Minister of Agriculture, indicating in detail the requirements laid down in respect of the marking of imported eggs.

All eggs imported into the Argentine must now be stamped with the name of the country of origin (the choice of six languages is given) and with an indication as to whether cold-storage ("refrigerado") or other means of preservation ("conservado") have been employed. The inscription must be in letters of not less than 2 mm. in height, marked with a durable ink stamp.

Eggs arriving in the Argentine are to be examined by Government Inspectors, for which purpose the importers, who must be registered by the Department of Agriculture, are to supply information as to the steamship in which the eggs have been consigned, its date of arrival, and other particulars. The eggs must satisfy the following conditions :—

(*a*) The shells must be strong, sound, clean and unwashed ;
(*b*) The white must be translucent and firm ;
(*c*) The yolk must be visible or slightly visible without signs of embryo.

Other regulations relate to the egg cases, which must be of non-odorous wood and must be of a size to hold 30 dozen eggs each. The internal fittings must be new cardboard fillers and cup flats. The cases must bear an inscription showing the species of eggs (e.g., hens' eggs), the country of origin, the name of the shipper and importer, the net and tare weights, and the month and year of packing. It is

further decreed that the cold-room of the vessel in which the eggs are transported must be clean, free from meat or other products or substances capable of imparting an unwholesome smell or taste to the eggs. Reference is also made to the method of refrigeration that is considered preferable for the storage chambers in the transporting vessels.

Sweden : Import Monopoly for Wheat and Rye.—In Sweden, the compulsory milling of a variable proportion or quota of home-grown wheat and rye has been in operation since September 1, 1930, and is controlled by the State Cereals Commission.

A further development occurred on June 1, 1931, when, by Royal Decree, a monopoly in the importation of wheat and rye or mixtures of wheat and rye or flour was granted to an association of millers entitled the Swedish Cereals Association. For the period June 1, 1931, to December 31, 1932, wheat or rye, or mixtures and flour thereof, may only be imported by members or licensees of this Association, which is debarred from itself trading in imported cereals.

In return for this monopoly, the Association contracted with the State to purchase, *during the months of June and July in the years* 1931 *and* 1932, all stocks of home-grown wheat and rye of satisfactory milling quality, whether on farms or in mills in Sweden. Further, the Association agreed to buy such stocks of Swedish-grown wheat and rye at minimum purchase prices to be fixed by the State. These have since been fixed for 1932 at 18.50 Kroner and 16.50 Kroner per 100 Kg. (44*s.* 4*d.* and 39*s.* 6*d.* per quarter of 480 lb. at par of exchange), respectively.

Apart from the requirements of the compulsory quota, as applied to individual millers, the market in Swedish grain was left free from any price regulation outside the months of June and July, 1931 and 1932. This has naturally led to some dissatisfaction over the prices received by those farmers who have been unable to hold their grain until the months of June and July, when the guaranteed prices operate, and the necessity for some form of control by producers over the marketing of grain is becoming increasingly obvious. The Swedish Cereals Association requires a substantial income to meet expenses and the probable loss on the realization of the stocks of home-grown grain. This income is provided by empowering the Association to make levies on imported wheat and rye or flour. The general principle observed in fixing these levies is that over the whole period, June 1, 1931, to December 31, 1932, the income of the Association will be just sufficient to meet costs and a maximum dividend of 5 per cent. on its capital. It is clear that the amount of the levy depends on the difference between world prices and those at which the Association must buy home-grown cereals in June and July, 1931 and 1932. Normally, the levies on wheat and rye are fixed by the Council of the Association, but, when the proposed levy on wheat exceeds 20 per cent. of the Stockholm price for wheat of normal quality, the Government sanction must be obtained for its ratification. In order to encourage exportation, the levies are remitted on re-exports of the cereals concerned.

The Association is required to keep its books open to the Cereals Commission and to supply it with information as called upon. Provision is also made for prolonging the contract period and for the State to take over the liabilities of the Association should this be found necessary at the end of December, 1932. Millers who enter the Association are allowed to adopt for cereals, milled at their own establishment, milling percentages 10 units below the statutory quota figure, and the millers agree not to charge excessive prices for flour.

The Swedish Cereals Association is open to all millers in Sweden, and is governed by a Council of eight members, with eight deputy members. The State nominates the Chairman, two other members, three deputy members, one of the two auditors, and a deputy auditor. Members of the Association, who derive from it their authority to import, must take up shares in the Association of 1,000 Kroner (approximately £55 at par of exchange) for every 50 tons of wheat and rye milled by them during the years 1928-30. Members also undertake to receive and store home-grown wheat and rye, on behalf of the Association, up to two-thirds of their storage capacity. They further agree to purchase at market prices from the Association a proportion of the home-grown cereals that it buys at the fixed price under its contract with the State. This proportion is based on the number of shares held by the members in the Association. In this way, the Association is assured of a market for the stocks of home-grown cereals that it must take over at the end of the season.

The millers' import monopoly has apparently so far worked satisfactorily and facilitated the operation of the milling quota system. The 1931-2 agreement is to remain operative so long as the organization of the milling industry is not seriously affected thereby, and the statutory quota obligations placed on millers are such as to allow a flour of good baking quality to be produced. To meet the millers on this last point, the milling quota for October and November was reduced, in view of the situation which arose from the poor quality harvest of 1931.

Although there has been some friction regarding the discounts associated with the standard of milling quality, it is claimed that, in spite of the price difficulties encountered in the early part of the season, already referred to, producers are satisfied that the measures taken have been to their advantage.

From the consumers' point of view, owing to falling world prices of cereals, it is claimed that the system has not caused any rise in the price, or any deterioration in quality, of the flour or bread.

* * * * * *

A NATIONAL MARK CIDER FARM

THE business of F. Rea & Sons is a Gloucestershire enterprise of a kind not often met with in this country, it being the large-scale production of cider and perry on the farm, mainly from purchased fruit. The output of cider and perry averages about 20,000 gal. per annum, about 1,000 gal. being perry and the rest cider. There are eight acres of cider apple orchard on the farm, but about 80 per cent. of the supplies of fruit used are bought from other farmers, some in the locality, but mainly in Somerset and Devon. No imported apples are used. The supplies bought are mainly mixed varieties, but a little more is paid for named sorts.

The buildings used for cider-making are ordinary farm buildings adapted for the purpose. The machinery was made in this country by a Bristol firm. The plant is driven by a 5/7 h.p. petrol engine.



FIG. 1.—The fruit washer and elevator.

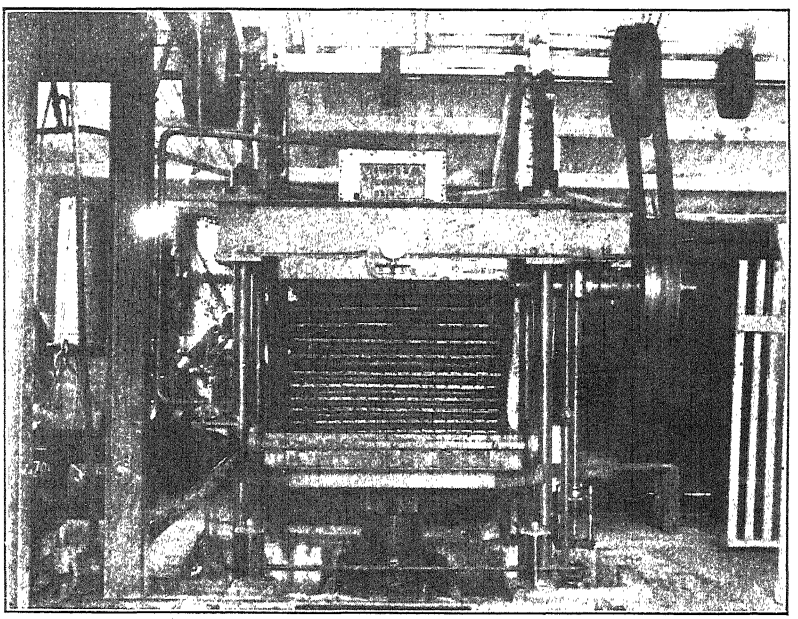


FIG. 3.—The hydraulic press.

A NATIONAL MARK CIDER FARM.

To face page 1018.

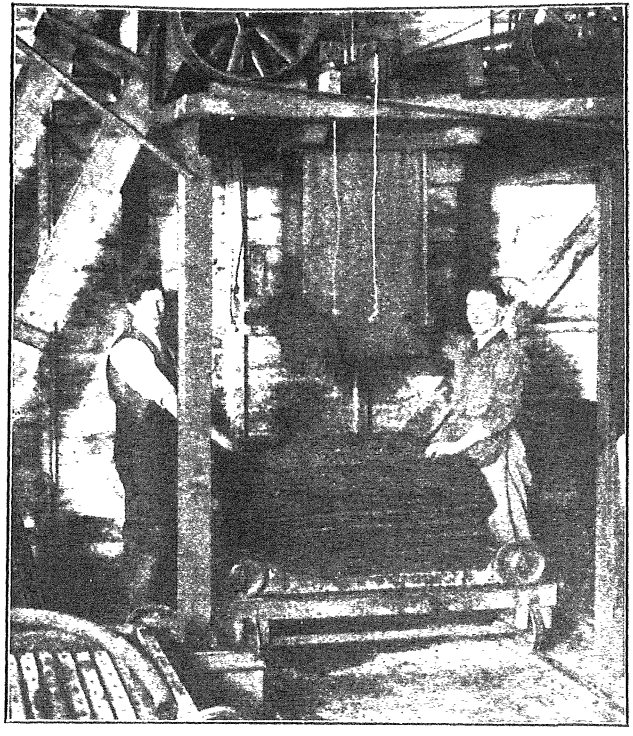


FIG. 2.—Building up the "cheese."

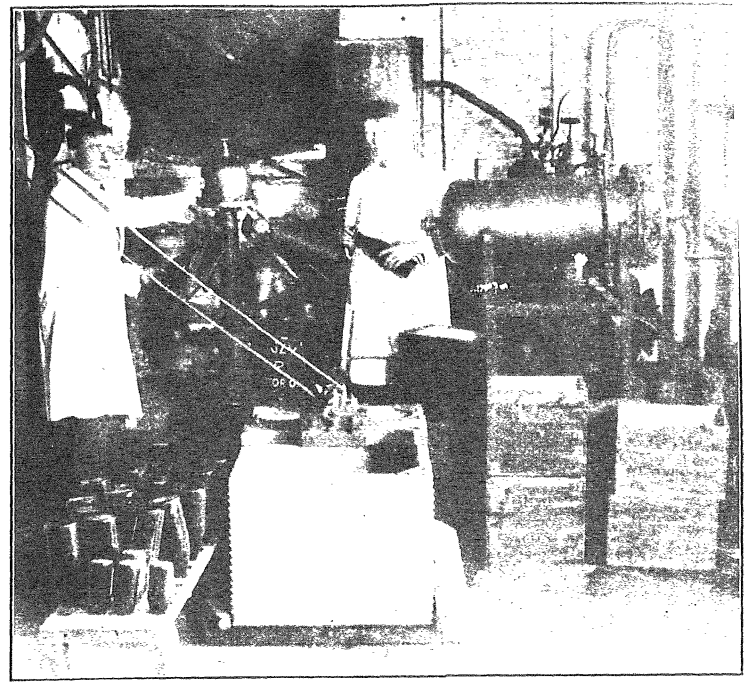


FIG. 4.—The carbonator, bottling machine and bottle-washing machine.

In the process of manufacture, the fruit is first shot from the bags into a tank of water (Fig. 1). This not only washes the fruit, but also separates loose dirt and other foreign matter, as well as rotten apples, which sink to the bottom. From the tank, the fruit is transferred by means of a pair of revolving paddles to an elevator, which consists of a travelling band with wooden cross-pieces running in a wooden trough (Fig. 1). The elevator delivers the fruit to a small crusher mill, working somewhat on the principle of a domestic mincing machine, but revolving at about 2,000 revolutions per minute. This reduces the fruit to a pulp known as pomace.

The mill delivers the pomace through a wooden spout on to a wheeled platform at floor level, where it has next to be built up into what is known as a "cheese." (Fig. 2). This is done in the following way. A wooden frame about 1 yd. square and 5 in. deep is placed on the platform and covered by a thick cotton cloth. Successive deliveries of pomace are made on to this cloth by opening a wooden trap in the spout. The pomace is spread out and pressed down by hand on the cloth within the frame and the corners of the cloth are then folded inwards so as completely to enclose it. The frame is then removed and a thin slatted board is placed upon the cloth containing the pomace. The frame is then placed on this board and the process repeated until a cheese weighing about half a ton and consisting of a pile of eleven cloths of pomace has been built up, each cloth separated from the next by a slatted board. The object of these boards is to allow the juice to escape when the cheese is subsequently pressed. The building of a cheese that will press evenly and without splitting is a matter of some skill. The cotton cloths used for the purpose are a great improvement on the old Manilla cloths formerly used, and a still greater improvement on the old method of building up the cheese by enclosing pomace in layers of straw; the juice is better strained and the cloths will stand a greater pressure.

The platform on which the cheese is built up is now run, along a pair of rails, to a hydraulic press (Fig. 3) to which the cheese is transferred. The press, on the ram of which is exerted a pressure of 2,000 lb. per sq. in.—about 100 tons in all—is set in motion and the juice is thus squeezed out. The hydraulic press will extract considerably more juice from a given quantity of pomace than the old screw presses that were formerly used. The production of juice per ton of apples is about 150 gal.

The juice runs from the press into a concrete tank let into the floor and is then pumped to a number of fermentation casks or "pipes" in another building. The residue remaining after pressing is used in small quantities at a time for cattle-feeding.

During the first few days in the pipes, the juice ferments rapidly, and froth, consisting of yeast cells and solid matter, is forced out through the bung hole. As soon as this violent fermentation subsides, the bung is closed with a cork, through the middle of which passes a glass air-valve, which enables the steady flow of carbon dioxide gas from the fermenting liquid to escape and at the same time prevents air entering the cask. The exclusion of air is essential to prevent acetic fermentation.

The result of fermentation is, of course, to convert the sugar content of the juice into alcohol; the "dryness" of the cider produced is determined by the extent to which this conversion takes place, which is indicated by the degree to which the specific gravity is reduced. The old method of manufacture was to allow fermentation to continue until practically all the sugar had been converted into alcohol, and then to add sugar as required. The method adopted in this case, however, is to stop fermentation when the required degree of sweetness—as indicated by a specific gravity of 1.025—has been reached. It is claimed that a cider of better flavour is produced in this way, but the method involves the danger that insufficient alcohol may be developed to enable the product to keep.

At this point, the cider is filtered through an upright "pulp" filter, and is then stored in pipes until required or bottled for maturing. For bottling, a carbonator and bottling machine have been installed (Fig. 4). A proportion of the bottled cider is "disgorged" by the method used in the "champagne" process.

National Mark cider is sold both in cask and bottle. The bulk of the draught cider produced is sold to public houses, but, as many local houses are owned by brewers, and the tendency is for the proportion of free houses to decrease, this outlet is somewhat restricted. Bottle and draught cider are, however, sent as far as London to private customers.

Being made entirely from the pure juice of apples or pears, the output of this firm is of the highest quality, and has obtained the first prize in 1931 and in previous years at the Brewers' Exhibition held in London.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1931*

PRODUCE OF CROPS

THERE has to be recorded this year a fall in the acreage under practically every crop, with lower yields than in the previous year and a corresponding drop in total production. Only in the case of barley and seeds hay is the result more satisfactory. These two crops show an increased acreage, a higher yield and consequently heavier estimated total production than in 1930. Meadow hay gave a slightly higher yield than in 1930, but, owing to a reduction in acreage, the estimated production is lower than in that year. Potatoes were grown on a slightly increased acreage, but a fall of just over 1 ton per acre in the yield has brought the estimated production down. In addition the tubers are small, and where disease was prevalent at lifting time and the potatoes were clamped in a wet and dirty condition, they are unlikely to keep well. Wheat, on the other hand, shows an increased yield, but not enough to compensate for the reduction in acreage. The estimated production is therefore lower than in 1930. The corn harvest was carried out under unusually difficult conditions : the excessive wet and lack of sunshine resulted in a good deal of corn being harvested in a damp and soft condition. Only in the case of oats, beans and hay are the estimated yields for the whole country above the 10 years' average.

Corn Crops : *Wheat.*—The slight increase in the estimated yield per acre was not sufficient to counterbalance the decrease in the acreage under wheat, and the total production, which is estimated at 19,225,000 cwt., is 2,182,000 cwt. less than in the previous year, a reduction of 10·2 per cent. Notwithstanding the slight increase of 0·2 cwt. per acre over the previous year, the yield per acre throughout the country, estimated at 16·1 cwt., is 1·6 cwt. below the 10 years' average. In only two counties in England and one in Wales, of minor importance as wheat-growing areas, is the yield appreciably above the average for the respective counties, and then by less than 1 cwt. per acre. In the North-Eastern and South-Western Divisions yields are 2·5 cwt. and 3·1 cwt. per acre respectively below the average for those divisions. The highest yield per acre for the year is returned by Lincoln (Holland), approximately 19 cwt. to the acre.

* This return was published on December 10, 1931.

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE CORN, HAY AND ROOT CROPS IN ENGLAND AND WALES IN 1931, WITH COMPARISONS FOR 1930, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1921-30.

Crops	Estimated Total Produce		Acreage		Estimated Yield per Acre		
	1931	1930	1931	1930	1931	1930	Average of the ten yrs., 1921–30
	Thousands of cwt.	Thousands of cwt.	Acres	Acres	Cwt.	Cwt.	Cwt.
Wheat ..	19,225	21,407	1,196,697	1,346,135	16·1	15·9	17·7
Barley ..	15,441	14,733	1,029,141	1,020,201	15·0	14·4	15·5
Oats ..	24,798	26,829	1,651,606	1,778,115	15·0	15·1	14·7
Mixed Corn	1,684	2,005	121,134	129,968	13·9	15·4	15·0
Beans ..	2,403	2,784	144,939	161,465	16·6	17·2	16·2
Peas ..	1,046	1,149	74,906	77,890	14·0	14·8	14·1
	Thousands of tons	Thousands of tons					
Seeds Hay*	2,605	2,329	1,726,444	1,595,045	30·2	29·2	27·6
Meadow Hay† ..	5,328	5,575	4,777,843	5,050,936	22·3	22·1	19·8
					Tons	Tons	Tons
Potatoes ..	2,407	2,743	446,772	424,660	5·4	6·5	6·3
Turnips & Swedes	6,979	7,931	618,753	670,224	11·3	11·8	12·3
Mangolds	4,523	5,438	269,665	287,902	16·8	18·9	19·1

* Hay from Clover, Sainfoin and Grasses under rotation.
† Hay from Permanent Grass.

Barley.—The area under the crop shows an increase of nearly 9,000 acres over the previous year. With a yield of 15·0 cwt. per acre, or only ½ cwt. below the ten years' average, the total production has increased by over 700,000 cwt. to 15,441,000 cwt. In just under half the counties in England and Wales the yield is above the average for the county, but only in the East Midland and North-Western divisions is the yield above the 10 years' average for the division.

Oats.—The yield of oats per acre is practically the same as in 1930, the difference being only ·1 cwt. per acre, but the area under the crop, 1,651,606 acres, shows a reduction of 126,509 acres as compared with the previous year. The net result is, therefore, that the estimated production of 24,798,000 cwt. is over 2,000,000 cwt. less than in 1930.

Over the whole country the estimated yield is slightly above the 10 years' average, and this improvement applies also to most county averages. The counties in which yields have fallen most markedly below the average for the county are Cornwall and Dorset, the drop being $2\frac{3}{4}$ and $2\frac{1}{2}$ cwt. per acre respectively.

Mixed Corn.—The reduced acreage under this crop, coupled with a smaller yield per acre, resulted in a lower estimated production than in either of the two previous years. The total production is estimated at 1,684,000 cwt. compared with 2,005,000 cwt. in 1930, and the yield is below the average for the previous 10 years.

Beans.—The acreage under beans in 1930 was greater by just over 17,000 acres than in the previous year, but this increase was not maintained in 1931, when the figure of 144,939 acres was only 500 acres more than in 1929. The yield per acre has also fallen from 17·2 cwt. in 1930 to 16·6 cwt., which is, however, better than the yield of 15·2 cwt. per acre in 1929, and the 10 years' average of 16·2 cwt. The estimated production of 2,403,000 cwt. is 381,000 cwt. less than in 1930, but 206,000 cwt. more than in 1929. The yields in the various divisions do not differ greatly either way from the 10 years' average. The greatest variation is seen in North Wales, where the yield is $1\frac{1}{2}$ cwt. above the average.

Peas.—Here again acreage, yield per acre, and consequently total production, were smaller in 1931 than in either of the two preceding years. The estimated yield of 14·0 cwt. per acre is also just below the 10 years' average. The total production of 1,046,000 cwt. shows a decline of just over 100,000 cwt. from that of 1930 and 235,000 cwt. from that of 1929.

Hay.—Harvest conditions were exceptionally difficult this year. The crop was abundant, but, after a promising, though somewhat late, start, the harvest was continually interrupted. In some areas the hay harvest was still in progress at the end of August. With the exception of the early cuts, which were secured in good condition, the larger portion of the crop was badly weathered and is of inferior quality. Notwithstanding a heavy aftermath very few second cuts of hay were taken owing to the abundant and protracted harvest of the first crop.

Seeds Hay.—The crop of seeds hay is estimated to have yielded 1 cwt. per acre more than in 1930, and to be $2\frac{1}{2}$ cwt. better than the average for the previous 10 years. The crop

was taken from 1,726,444 acres, or 131,399 acres more than last year: the estimated total production of 2,605,000 tons also shows a considerable increase over the previous year. Only three counties in England show yields below their average for the previous 10 years, namely, Cornwall, Yorks, East Riding, and Westmorland: in Wales, Anglesey and Cardigan are slightly below average, and Radnor 3 cwt. per acre below. In England, counties with yields considerably above the average per acre are East Suffolk (9¼ cwt.), Berkshire (7 cwt.), Wiltshire and Soke of Peterborough (6½ cwt.). In Wales, Monmouth shows a yield of 5¾ cwt. per acre above the average for the county.

Meadow Hay.—The total production of meadow hay, estimated at 5,328,000 tons, is 247,000 tons less than in 1930. The yield per acre of 22·3 cwt. is very slightly in excess of the yield of the previous year, but the acreage has fallen from 5,050,936 acres to 4,777,843 acres, the increase noted in 1930 not being maintained. The estimated yield per acre is 2½ cwt. above the 10 years' average. Yields ranging from 9 cwt. to 6 cwt. per acre above the average for the county are reported from the Soke of Peterborough, Wiltshire, Worcestershire and Bucks. In only Yorks, East Riding, West Sussex, Cornwall, Westmorland and three Welsh counties is the yield below average.

Potatoes.—The acreage under potatoes increased from 424,660 acres in 1930 to 446,772 acres in the current year. As a result of the unfavourable season, however, the low estimated yield of 5·4 tons per acre has more than counterbalanced the increased acreage, and the estimated production of 2,407,000 tons is 336,000 tons less than the previous year, and is the lowest total production since 1912. The estimated yield of 5·4 tons per acre compares very unfavourably with the yield of 6·5 tons in 1930 and the 10 years' average of 6·3 tons. In spite of the generally adverse conditions, five counties in England show yields of 1-1¼ tons per acre above their average, namely: Suffolk, East and West, Essex, Herts and Rutland. In the Eastern and South-Eastern divisions, yields are a little above average, but the North-Eastern, South-Western and Northern divisions each show yields about 1½ tons per acre below average. The yield in Wales is consistently below the 10 years' average.

Roots.—*Turnips and Swedes.*—The yield of turnips and swedes, which is estimated at 11·3 tons per acre, is ½ ton per acre less than in 1930 and 1 ton per acre smaller than

the average for the 10 previous years. The estimated production of 6,979,000 tons is 952,000 tons less than the production for the previous year, but this big drop is mainly due to the fact that the area under the crop was over 50,000 acres smaller than in 1930. A few counties in England returned yields appreciably larger than average. The yield in the Soke of Peterborough is over 3 tons per acre in excess of the county average, and in Surrey and East Sussex, 2¼ tons. The counties showing the worst yields are Salop, 3¾ tons below the county average, Lincoln (Holland) 3½ tons below and the Isle of Wight and Monmouth, both 3 tons below. Only one division, the South-Eastern, shows a yield above the average.

Mangolds.—The total production of this crop is estimated at 4,523,000 tons, or 915,000 tons less than in 1930. The crop was, however, taken from an area smaller by 18,237 acres than in the previous year, and the estimated yield is also 2 tons per acre less. Only four counties in England (Essex, Kent, Surrey and East Sussex), and Radnor in Wales, returned yields above the local average. The increases in these counties range from 1¼ to 2¼ tons per acre. With the exception of Cambridge, Northampton, Anglesey and Carnarvon, where yields are just above average, the remainder of the country has produced yields below average. In Yorks, North Riding, and Westmorland, yields are 6 tons and 6¼ tons respectively below the local averages.

Sugar-Beet.—The acreage under sugar-beet in the current year was very considerably less than in 1930. The heavy drop was due to the lower price offered for beet at the beginning of the season consequent on the reduction of the subsidy. The season has also been unfavourable, with the result that the estimated yield per acre of 7·4 tons is 1 ton below the yield for the previous year. The tonnage of washed and topped beets will therefore be considerably less than in 1930, and is not expected to exceed 2 million tons. Sugar content, however, is higher than last year.

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COUNCIL OF AGRICULTURE FOR ENGLAND

THE Thirty-Seventh Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on Thursday, December 10, 1931. *Mr. James Hamilton* (Lancs.) in the Chair.

The Chairman welcomed the Rt. Hon. Sir John Gilmour, M.P., Minister of Agriculture, to the first meeting of the Council which had taken place since his appointment as Minister.

Minister's Address.—*Sir John Gilmour*, in the course of his address, said that the Agenda for the day gave a very wide and interesting range of subjects. He would comment on one or two of the main items, but unfortunately he would be unable to remain a listener to the discussions as he had to attend a Cabinet Meeting. One of the first tasks he had to perform on taking office was the unpleasant one of making great economies in expenditure. He had tried to make these without inflicting real injury upon essential elements, and he hoped that all concerned would realize that they formed a necessary contribution towards the national economy needed in these serious days.

As regards policy for the future, he had, in the course of a short time, met many deputations, and he could well understand the anxiety which existed in the agricultural community to know at the earliest possible moment what course the National Government would pursue. One of the key problems was that of arable land, and he had therefore asked his colleagues to allow the introduction of the Wheat Quota. Whatever the Government might do to assist the agricultural industry, however, such assistance did not mean that the Government, or the Department, ought to run the industry. Their business was to assist, help and direct, but not to run, agriculture, if the industry was to be successful. The town-dweller was more ready to-day to view with favour something being done for the industry than ever before. But the town-dweller was going through his difficult times, too, and if agriculture was to keep his goodwill it was essential that home produce should be put before him in an attractive, clean and wholesome condition.

As regards the Wheat Quota, he had placed before the various interests concerned, confidentially at the moment, details of the proposals, and had asked the interests to examine them. He thought he would be justified in saying

there that he was a little surprised that some sections, with whom he had so conferred, had seen fit, in the advertisement columns of the Press, to make statements which, if they were to be regarded either by himself or the Government, would be a dictation of the policy of the Government upon a question which was solely the Government's affair. He would say quite emphatically that, while he was most anxious to work in an amicable fashion with every interest, to listen to all suggestions which they had to make, there was a form of dictation which he wished those people to understand was bound to defeat itself.

After wheat had been disposed of, there remained the problems of sugar-beet, barley, pig products and live-stock breeding. He and the Ministry were working on those problems. Action had been taken experimentally to deal with imports of certain horticultural products. If there was disappointment in the range of the schedule of these products, he asked the Council to realize that he was very anxious, at the outset of a new policy, not to make a mistake which might be found a greater disadvantage later on than a measure of delay now. What he asked was a breathing space between now and the time that Parliament met again so that he could carefully go into the various problems concerned. He would not dally, and the Council could be sure that he and those who worked with him at the Ministry were well aware of the necessity of urgency so as to give confidence to the agricultural community.

Two of the items down for discussion to-day ranged around the pig and the milk industries. As regards the motion on the Paper dealing with the latter, the milk industry ought to show some definite evidence within itself that it desired to have the Ministry's assistance under Section 15 of the Act. He did not feel justified in spending public money upon inquiries unless he was satisfied that the industry gave a definite indication that they were prepared to go forward when the result of that inquiry was complete. Any reorganization must come from those engaged in the industry. Again, if the industry were going to ask the Government for protection against milk imports—fresh, dried or tinned—they must clearly give some indication that they would do all that was possible to replace the imports that would be excluded by this means.

In conclusion, Sir John Gilmour said that he hoped that, in the period in which he held the high office of Minister,

he might at least have the confidence and goodwill of those who, like the Council, spoke for agriculture. He could assure the Council that he would give his whole-hearted energy to his task, and would do what he thought was for the best of the industry.

Lt.-Col. Sir Merrik Burrell, Bart., C.B.E. (West Sussex), thanked the Minister on behalf of the Council for his speech, and congratulated him on his appointment as Minister and on the opportunity which had come to the industry during this present time. The advice which Sir John had given to-day was on exactly parallel lines with that which the Standing Committee of the Council had been giving to the Council for the last four years, and that gave him hope that in the years to come he would find the Council of more and more assistance, as, indeed, it was the desire of the Council to be. *The Minister* thanked Sir Merrik Burrell, and said that he was emboldened to suggest that the Agricultural Advisory Committee might be called to consider the question of the Wheat Quota. He would be prepared to give it, confidentially, the facts that he had given other bodies, and would be grateful for its advice.

Marketing of Sheep, Mutton and Lamb.—*Mr. Denton Woodhead,* on behalf of the Standing Committee, moved the adoption of the Committee's Report on the Marketing of Sheep, Mutton and Lamb. (See Appendix I, page 1039.) The Report was received and adopted.

Agricultural Marketing Act, 1931.—*Mr. Denton Woodhead* recommended the adoption of the Standing Committee's Report on the Agricultural Marketing Act, 1931. (See Appendix II, page 1043.) In the course of his remarks, Mr. Woodhead said that he was sure the Act could be made a most useful one in helping agriculturists to help themselves without doing any injustice to the consumer. *Brig.-Gen. H. Clifton Brown, M.P.* (West Sussex), suggested that the word "liquid" should be put in before the word "milk" in paragraph 2 of the Report.

Major F. H. Fawkes (West Riding) pointed out that what was meant was milk and dairy products. *Mr. W. J. Cumber* (Berks) suggested that the word "milk" be left out altogether as it was a commodity which was now being imported into the country. *The Chairman* pointed out that the commodities named in the Report were those in which the country was

"largely" self-supporting, not "entirely" self-supporting. *Sir Walter Berry, K.B.E.*, spoke as regards the mention of potatoes and hops. He gave certain instances, and said he was doubtful whether organization could produce better prices in either commodity than the farmer himself could obtain. He was very grateful for all that was being done in investigating marketing questions, but he thought that careful consideration should be given to such facts as he had mentioned before changes were made. *Mr. George Dallas* said that the Report did not pledge the Council to any type of scheme whatever, and the details of the kind of reorganization required for any particular commodity would be gone into by the producers, or by the boards themselves. The Report was then adopted.

County Agricultural Education Services.—*Mr. Denton Woodhead* presented the Standing Committee's Report on County Agricultural Services. (See Appendix III, page 1044.) The Report was received and adopted.

Re-election of Standing Committee.—The Standing Committee, composed as follows, was on the motion of *Miss Gladys Pott, M.B.E.*, seconded by *Mr. R. Anderson* (Northumberland), re-elected: *Landowners*—Sir Francis Acland, Sir Merrik Burrell, Major Fawkes, Sir Arthur Hazlerigg, Sir Douglas Newton and Lord Clinton; *Tenants*—Mr. J. Hamilton, Mr. R. G. Patterson, Mr. G. G. Rea, Mr. Cecil Robinson and Mr. Clement Smith; *Workers*—Professor Ashby, Mr. George Dallas, Sir George Edwards, Mr. G. E. Hewitt, Lady Mabel Smith and Mr. Denton Woodhead.

Development of the Pig Industry.—*Sir Douglas Newton, K.B.E., M.P.* (Cambs), moved the following resolution:—

> That the Council requests the Government to formulate a comprehensive national policy for the development of the Pig Industry.

Sir Douglas gave figures showing how lamentably the pig population had failed to keep pace with the growing demand of the country for pig products. In Denmark, he pointed out, the operation had been exactly the reverse. The Danes had stepped in where Englishmen had failed. He called attention to the importance of the Orange Book, Economic Series No. 12, and to the Ministry's recently issued Bulletin by Mr. W. A. Stewart on Pig-Keeping (No. 32). Our position, he said, was due largely to lack of organization in the industry

and to the lack of stability in price. There were enough bacon factories, but they were not being supplied in the right way. The demands of the pork market were continually cutting across those of the factories. In pig-keeping, capital could be turned over three times in the year, and the pig could be fed largely upon surplus potatoes and surplus milk. He suggested that we should establish breeding centres like the 200 or more that had been set up in Denmark. We could then standardize the pig for bacon and pork. Sir Douglas referred also to the depreciation in the purchasing power of money and the importance, in the national interest, of giving as much employment to our own people as possible and keeping money in the country.

Dr. Chas. Crowther, M.A., Ph.D., seconded the resolution. He had, he said, a strong conviction that the industry would be able to render valuable assistance to the nation at the present time. He would refer to the special merits of the industry for this purpose. First, it dealt with a commodity in which the country could, if it liked, be entirely self-supplying, the animal living to the extent of at least 90 per cent. upon products which could be produced entirely at home. Then pigs could be kept by any of the whole range of agricultural producers. Reorganization of our present methods, both of production and disposal, were absolutely necessary. There must be so many tons of bacon of a particular quality supplied. The consumer would not willingly accept supplies of irregular quality.

There were two major difficulties which had to be solved. First, conditions had to be established which would give a reasonable assurance to all concerned of a fair profit for their labour. The second was the need to obtain a greater measure of control over disease than existed at present. In Denmark there was very little swine fever. The policy, if we were to have a policy, should start not with the farmer but with the bacon-curing industry, the first step being for the industry to rationalize itself and be organized solely so as to enable it to keep to differential prices to be paid according to whether the producer was supplying the article most wanted or not. At present, the majority, the larger firms, gave no advantage whatever to the intelligent pig producer. If this change were made, the farmer would be found then to adjust himself very quickly to the new conditions. Without it, the whole effort to capture our own market would be doomed to failure. The change would also put in proper perspective the problem of

multiplicity of breeds. Whatever measures were taken should, he thought, be coupled with education and research. A new and vigorous policy would need definite educational propaganda and continued research for its ultimate improvement.

Mr. T. Lovell spoke in support of the resolution. Most farm workers could keep a pig, and much garden and allotment waste was thrown away to-day which might be better used in pig-keeping. Pigs were not kept because the local Council's inspectors were often too hard in applying the sanitary regulations, and they should be cautioned in the matter. *Sir Walter Berry* said that the waste from cottage gardens would not make bacon which factories would accept. He had found that factories would give higher prices for animals which were satisfactory. The trouble was that when a factory had sufficient bacon pigs it put down its price to a level which left a loss rather than a profit. He, therefore, had had on three occasions to give up keeping bacon pigs. *Mr. Christopher Turnor* pointed out that the industry in Denmark was a subsidiary one to the dairy industry. If it were attempted to make it into a main industry in this country we might not be able to compete in price with Denmark. He considered that proper organization would eliminate the difficulty referred to by Sir Walter Berry. The Danish factories did not treat producers in the way of which he had complained. The pork market was also important, and there would need to be a balance. The number of breeds would certainly have to be reduced. In Denmark, the bacon pig was universal and was the result of the importation of Yorkshire pigs many years ago. *Mr. J. S. Gibbons* (Gloucester) thought the whole matter boiled down to stability of price. He had not found much in the question of the numerous breeds. When prices went down, people sold their breeding sows, and in a year or two were very sorry that they had done it. The keeping of pigs by cottage holders in his district had very much gone out, and he did not understand why.

Lord De La Warr, Parliamentary Secretary to the Ministry, said that it was clear from the speeches of the proposer, seconder and supporters that the Council was thinking on much the same lines as the Government. The weaknesses in the industry had to be corrected before a comprehensive policy with control of imports could be adopted. The Government had already been in touch with the Pig Industry Council in the matter and had given them to understand that, if a definite scheme could be presented to place the

industry on a really sound basis, the Government were prepared to discuss with that Council any necessary further steps as regards imports. It might be necessary, if the pig industry could not submit a scheme, to set up a Pig and Bacon Reorganization Commission under the new Marketing Act.

The resolution was put to the meeting and carried.

Central Chamber's Report on Agricultural Policy.—*Sir Merrik Burrell* moved the following resolution :—

> That the Council supports the general principles laid down in the "Report of the Joint Committee on Agricultural Policy," issued by the Central Chamber of Agriculture, copies of which have been circulated to all members of the Council. The Council agrees in particular with the suggestion for the institution of a non-political advisory body to advise on any control of imports of agricultural products that it may be found necessary or desirable to impose ; and particularly welcomes the support of the leaders of other industries to the proposals.

Sir Merrik, in the course of his speech, said he thought that this Report on Agricultural Policy was a sound one, complementary to that of the late Minister of Agriculture in that it dealt with the control of those imports, the organization of the marketing of which had been the main part of his policy. It had been prepared with the advice and support of representatives of the other industries in this country, as represented by the Federation of British Industries and the National Union of Manufacturers. This had never happened before with a policy for agriculture. He sketched the history of the Report to show that the claim he made was well founded. A prosperous agriculture would, he said, mean a very considerable difference to the national balance sheet. If the country could produce another £200,000,000 worth of foodstuffs a year the position would be vastly changed, not only as regards finance but employment, and the dole money would be saved. The urban population, in any revival, would, however, need to understand the position of agriculture and what agriculture could afford, and, on the other hand, would need to be absolutely fairly treated by agriculture. The producer should make a fair profit, and the consumer should not be asked to carry the burden of inefficiency. It was not possible for the Council to go into the details of the Central Chamber's policy to-day; what he asked was a general acceptance of principles. He thought that the constitution of a non-political advisory body, as suggested in the resolution, was essential.

Col. Sir G. L. Courthope, K.B.E., M.P., seconding the resolution, said he hoped the Council would be able to give the policy its whole-hearted support on its general principles,

though there might be points of detail which did not entirely meet individual views. The great thing about it was that it had the backing of the urban as well as the rural industry. Many months of careful work had been given to it, and he could whole-heartedly commend it to the Council. *Mr. R. C. Grey* (Hunts) said that, as regards the part of the Central Chamber's policy which concerned wheat, it was not the quota as put forward by Sir John Gilmour, but was a quota with a guaranteed price. He criticized the Central Chamber's policy in other respects. It should have concentrated on one or two points and might have dealt with barley, of which we imported £5½ millions' worth, only half-a-million of which came from within the Empire. In two years we could grow all the barley we required, and the Government could assist the industry through it without touching the food of the people directly. *Mr. John Beard* said that there existed some misapprehension in the mind of the last speaker. The proposition was no more than to set up machinery. The principles concerned had already been adopted in coal, electricity, and in traffic. He thought it better to remove agriculture from an atmosphere in which politics meant so much, to an atmosphere where votes were disregarded. No lasting progress would be made until machinery for the industry was created. *Mr. W. B. Taylor* (Norfolk) supported the resolution. The policy outlined in the Report recognized that the farm worker was not only a worker but a junior partner in the industry. *Sir Merrik Burrell* replied to the debate.

The resolution was put to the meeting and carried.

Marking Imported Potatoes.—*Mr. Cecil Robinson* (Holland) moved the following resolution :—

> That the Council requests the Standing Committee to inquire into the question of marking imported potatoes as to their country of origin under the Merchandise Marks Act, 1926, and to report to the Council upon it at its next meeting.

He said that during the month of October 91,654 tons of foreign potatoes were imported, of a total value of £457,419; from November 1 to 14, 54,817 tons were imported, of a total value of £320,000. It would have been better if these potatoes had been grown in this country. Potato growers claimed that they could produce a bigger crop than they were now doing, and of potatoes of the finest quality. He thought that consumers would be glad to help if they were sure that they were buying British. *Mr. Clement Smith* (East Suffolk) seconded the resolution. *Mr. H. C. Gardner* (Worcester) said that some farmers did not play the game, inasmuch as they sometimes bought

foreign potatoes and sold them as English. *Mr. G. E. Hewitt* cordially agreed with the resolution, and *Mr. R. L. Walker* (West Riding) and *Mr. J. T. Briggs* (Soke of Peterborough) also supported it. *A member* said that such farmers as had been mentioned by Mr. Gardner should be severely dealt with and *Mr. Robinson* agreed that a fine of £20, or three months' imprisonment, should be imposed.

The resolution was put to the meeting and carried.

Wheat Quota.—*Mr. R. C. Grey* moved the following resolution :—

> That in view of the importance of the Quota, this Council desires the Ministry to ascertain the working of the system in Germany, and any other country, as to its reliability and effect on prices both to producer and consumer; also its effect upon the milling industry; and to publish for the information and guidance of this Council the results of such inquiry.

Mr. Grey said that it was common knowledge that the quota in Germany could not be worked successfully without a very high tariff, and a prohibition, or a tariff almost equal to it, on the import of flour. He did not think that the quota could be worked without a tariff or a guaranteed price. The consumer would have to stand the effect. It was undeniable that the loaf in Germany cost more than twice as much as it did in this country. *Lord De La Warr* explained that the Ministry had already made inquiries into the systems at work in other countries, and that it was not advisable or necessary to publish the information which had been obtained.

The resolution was not seconded.

Reorganization Commission for Milk.—Mr. C. H. Roberts (*Cumberland*) moved the following resolution:—

> That in view of the present position of the trade in milk and dairy produce, of the need of reorganization, and of the complexity of organization in this trade, the Council of Agriculture for England requests the Minister of Agriculture to appoint, as provided by Section 15 of the Agricultural Marketing Act, a Reorganization Commission to consider this trade in England and Wales, and to suggest a practical scheme.

He said that he had put this motion in the form of a specific request for a Reorganization Commission because the matter was a particularly important one. The Minister had earlier in the meeting said, in effect, that he required some guarantee that the industry, as a whole, wanted a Commission. That statement was a strong argument in favour of his motion. The Central Chamber of Agriculture yesterday passed a similar resolution, and the Parliamentary Committee of the Conservative Party had taken a similar step. In addition, the

Minister wanted assurance that the dairying industry, as a whole, would support the result of such a Commission. The National Farmers' Union had what they call in the North a "scunner" against the Marketing Act and would not vote for it, though they were prepared to consider any scheme that might be drawn up and submitted to them. Last month, there was a meeting of the Chairmen of County Milk Committees of the N.F.U., and 45 counties were represented. By a majority, and with no opposition, a resolution was carried asking for a scheme of reorganization, plus the principle of compulsion. Mr. Roberts said he had the backing of the Cumberland Branch of the N.F.U., which, without opposition, endorsed a memorandum asking for a Reorganization Commission. He thought that the Minister might act if he got this resolution from the Council this morning. What was asked was that there should be a survey of the whole problem of milk reorganization, with a view to giving a scheme a start. The Minister had but to "kick-off." The position was that thousands of small producers were faced by large and powerful distributive organizations which were growing stronger every day. There was a surplus of milk supply of unknown quantity. There were two prices, one for liquid and one for surplus milk. All farmers, in spite of collective bargaining, tumbled over one another to get a share of the higher liquid prices. They did this to the extent of underselling each other, and they had no power to adjust production to demand. They did not even organize for the disposal of the surplus milk. Mr. Roberts instanced the recent happenings in the milk industry as showing how unprotected the producer was against the powerful distributive agencies. Then came the shortage of milk, and the importation of it from Esbjerg and Holland. Clearly, the industry required organization. Farmers of this country had what was, practically speaking, a natural monopoly, and they did nothing with it.

Major Fawkes seconded the resolution. He said the milk industry was in a chaotic condition. Organization was required. No part of agriculture was so difficult and complex, and organization was therefore all the more necessary. Producers in the North, where the position was more acute than in the South, were now ready to clutch at a straw. They had all been beaten by the sudden drop of 4*d.* per gallon. The Co-operative Society had come in; but the small producer was absolutely at the mercy of the retailer. The retailer now was at work in the rural areas—in the Dales—playing off one producer against another, and the price was varying from 1*s.* 4*d.* to 9*d.* in the

winter, and from 1*s.* 3*d.* to 6½*d.* in the summer. The position was really desperate. It was now up to the industry to go to the Minister and say that it was ready to take advantage of the Act, and he would then, as he had said, feel justified in setting up a Reorganization Commission.

Brig.-Gen. Clifton Brown also spoke in favour of the resolution. *Mr. Cumber* was opposed to it. He submitted that stronger evidence was required. Major Fawkes might get a flat rate for milk throughout the country which would do away with his great variations, but many milk producers did not desire that, especially those who produced under the best conditions and took the greatest care. *Major Fawkes* said he did not advocate the same price to all producers. *Mr. Cumber* went on to say that those milk producers who were doing their job thoroughly and well had no wish to come in the scheme if they had to carry with them those men who were doing their job badly.

Lord De La Warr said that the Minister would value very much the expression of opinion of the Council on what was, perhaps, the most important question facing agriculture at the present moment. The Government were now up against the necessity for the most drastic economy, and the country would not be justified in spending money on preparing a scheme simply for it to be criticized and not carried out. *Mr. Roberts* replied briefly to the discussion, and asked whether there was any way in which milk producers could assure the Minister, through other organizations, that they were anxious to act. *Lord De La Warr* intimated that the Ministry would be glad to learn in any way open to producers of their desire for the appointment of a Reorganization Commission. The resolution was put to the meeting and carried.

Price of Wheat and Cost of Loaf.—*Mr. Christopher Turnor* moved the following resolution :—

> That the Council asks the Minister of Agriculture, in view of the proposal for a quota of home-grown wheat flour in the loaf, to have prepared and published a statement of the cost of the 4-lb. loaf to the public and the cost of wheat per quarter (or cwt.) at the present time, and in each month of the last two years, in order that the relation between the retail price of the 4-lb. loaf and the cost of wheat per quarter (or cwt.) may be generally known. In addition, that the Standing Committee be asked to keep in touch with this question so that the Council may be informed from time to time upon it.

The resolution was seconded by *Miss Gladys Pott*, and was supported by *Mr. H. W. Thomas* (Hants), *Mr. J. O. Adams* (Northants), who asked that information might also be

published as to the cost of the manufacture of bread, *Sir George Edwards, O.B.E.*, and *Mr. Clement Smith*. The resolution was put to the meeting and carried unanimously.

Sir Charles Howell Thomas, K.C.B., C.M.G., Permanent Secretary to the Ministry, said that the Department would be pleased to prepare a statement giving the information required. It would be circulated later to Mr. Christopher Turnor, the Standing Committee, and members of the Council. He could not undertake to include in the statement figures as to the cost of manufacture of the loaf.

Tax on Imported Malting Barley.—*Mr. W. W. Sampson* (Dorset) moved the following resolution :—

> That this Council views with alarm the restricted demand for malting barley, and, being informed by the trade that this is due to the decreased consumption of beer caused by the extra taxation on beer imposed for revenue purposes, the Council suggests that in the interests of barley growers a tariff on imported malting barley be substituted for the extra taxation.

Mr. Sampson said he did not criticize the action taken by the late Chancellor in putting an extra tax on beer, though he felt sure that had the Chancellor known the result to the barley grower he would never have put it on. The brewers handed the tax on to the consumer and there had been a great decrease in consumption. The barrelage assessed for duty in October, 1930, was 1,572,000 barrels, and in October, 1931, 1,152,000 barrels, or a 25 per cent. reduction. The financial position of the grower of good malting barley to-day was very precarious. If he had to take 25s., or more, less for his malting barley because he had to sell it as feeding barley, his plight was serious indeed. He thought that unless some encouragement were given to barley growers, what the Minister had characterized as undesirable would happen, viz., that wheat would be grown on unsuitable land as a result of the quota. People would try to grow wheat on light land and would certainly not be getting the most out of that land. *Mr. J. Evens* seconded the resolution, and said that there was a large proportion of the very useful good barley grown to-day that was unsaleable for malting, and that the beer sold to the British people was being brewed largely from foreign barley. *Mr. W. Holmes* spoke to the effect that the restriction in the consumption of beer was somewhat due to the reductions in wages which had taken place through measures of national economy. He wanted to see British beer brewed from British barley and less chemical substitutes used in its manufacture. *Mr. G. G. Rea, C.B.E.* (Northumberland), said that barley was the more

important crop in Northumberland. At the beginning of this season, good samples of barley were saleable at fair prices; but when the larger demand for malting barley came to be supplied from abroad, our own barleys had become unsaleable. He hoped that the resolution would be unanimously accepted, and that the Minister would see the force of bringing in a measure which would stabilize the price of barley in this country. The resolution was put to the meeting and carried.

Import Duties on Milk, Milk Products, Eggs and Manufactured Food Products.—*Mr. R. Anderson* asked leave to withdraw the resolution on the Agenda Paper and to substitute in its place the following:—

> That this Council presses for the establishment of import duties on milk, milk products, eggs and manufactured food products coming from abroad which can be produced in this country, and is of opinion that these duties should be such as to make the value of the imported article or product comparable with the cost of production in this country.

This permission was accorded.

He said that this country could produce all the milk it required. The regulations for milk production and dairy cleanliness, as well as the regulations for minimum agricultural wages, all operated against the producer in this country: probably, overhead charges were from 25 to 45 per cent. less abroad than they were here. Fresh milk was now coming in from abroad, and it should be stopped. Butter was coming in from Russia. It was probably produced by slave labour, and the milk from which the butter came might be handled by any sort of labour. Liquid eggs came from China, and we did not know what kind of labour handled them. He thought it was only fair to ask that these products should at least be subject to import duties. *Mr. S. Wallace* (Herts) seconded the resolution, and *Mr. Woodhead*, *Major Fawkes*, and *Mr. W. Hasler* (Essex) spoke upon it, the latter moving that the motion should be adjourned for further consideration and discussion. This motion was seconded and put to the Council, and the main motion was accordingly adjourned until the next meeting.

Wheat Quota, Barley Quota and Tariffs on Dumped Produce.—*Colonel P. J. House, T.D.* (Hants), moved the following resolution:—

> That this Council asks His Majesty's Government to reconsider the proposals for meeting the depression in the Agricultural Industry by the following measures:—
>
> (1) The Quota proposals to include malting barley as well as wheat.

(2) The Quota proposals to apply to 1931 harvest.
(3) Tariff proposals to apply not only to luxury produce, but also to dumped produce imported—(a) under subsidy; (b) at a price less than the cost of production in the country of origin; (c) produced by slave or forced labour.

In moving the motion, Colonel House said that he thought Mr. Sampson had dealt very adequately with barley and that a tax on imported malting barley seemed better than a barley quota. As regards the application of the Wheat Quota to 1931 harvest, he thought it would be of the very greatest help if that could be allowed: it would enable the farmers to plough more land and employ a vastly increased amount of labour. As regards the tariffs, he thought that the dumping of produce and so under-cutting our market was very unfair, and that the sooner tariffs could be imposed the better. *Mr. R. G. Patterson, O.B.E.* (Staffs), seconded the motion. He said that to keep the quota for the 1932 crop was delaying the matter too long. By that time, many farmers would be in no position to take advantage of it. The motion was put to the Council and carried.

APPENDIX I

REPORT FROM THE STANDING COMMITTEE ON THE SUBJECT OF THE MARKETING OF SHEEP, MUTTON AND LAMB

(1) In the Standing Committee's Report to the Council, dated October 8, 1928, on Better Marketing of Live Stock and Meat, the question of securing improvement in the current arrangements for the marketing of sheep, mutton and lamb in the country was referred to.

(2) The Committee then said that there could be no question that the sale of mutton and lamb from the farmer's point of view would benefit by a system of meat grading, and that improved prices for the higher qualities would undoubtedly react on the price paid for live sheep.

(3) Since the date of that Report, much progress has been made by the Ministry of Agriculture in the matter of grading and marking various agricultural commodities in all parts of England and Wales, and of beef in London, Birmingham and parts of the West Riding of Yorkshire.

(4) More recently, the Ministry has issued a Report on the Marketing of Sheep, Mutton and Lamb in England and Wales (Economic Series No. 29—a very full treatise with many plates and diagrams); and the Agricultural Marketing Act, 1931, has been passed. The Report, incidentally, advocates the use of the National Mark on home-produced mutton and lamb, and the Marketing Act makes provision for effective combinations of producers as the authority for the purpose of organizing the wholesale marketing arrangements of their several commodities in this country.

(5) The Standing Committee heartily endorses the suggestion for a National Mark for mutton and lamb, following upon the proper grading of carcasses. It is also strongly in favour of farmers combining to secure proper marketing conditions and prices for their products,

and it hopes that all members of the Council will join with the Committee in bringing these two important requirements prominently to the notice of farmers.

(6) The Ministry's Report gives members fairly complete information on the economics of the industry. In 1900, the home supplies of mutton and lamb in Great Britain were 54·6 per cent. of the total consumption. In 1929-30, home production was only 41·9 per cent. of the total. As regards the numbers of sheep in England and Wales, there was a progressive decline from 1909 to 1923, *i.e.*, from 20 million to 13½ million, and, thereafter, an increase, with annual fluctuations, to 16,300,000 in 1930, or back only to the figure of 1919. In 1931, there was, as stated in the next paragraph, a very considerable increase on this figure.

(7) It is not suggested that the figures showing a decline from 20 million in 1909 to 16½ million in 1930 indicate a retrograde movement, since the numbers of sheep and lambs may quite possibly fall whilst agriculture in general may improve in total value of output. The increase since 1923, however, is correlated with a progressive depression in agriculture, and there is perhaps greater inducement to-day to farmers to lay down land to grass than ever there has been in recent agricultural history. The recently published figure for sheep and lambs for 1931 (17,745,400) with an increase of nearly 1½ million emphasizes this position. This increase, it should be noted, is directly the result of arable depression, and it has taken place in spite of the reduction of arable sheep flocks, which were largely diminished at the passing of so much arable land.

(8) The figure of the importations into the United Kingdom of frozen mutton and lamb at the beginning of this century stood at 3½ million cwt. (value £6 million). By 1930, it had grown to over 6½ million cwt. (value £20 million).

(9) How far any possible expansion in the home production of mutton and lamb would depend on limitation or regulation of imports, and how far on a continuance of depression in arable agriculture, it is impossible to say. Limitation of imports would be a benefit to sheep production as an essential item in agricultural economy, but the present depression in agriculture, which may, incidentally, foster such production, should certainly be removed. It would be in the best interests of British agriculture if both arable and pasture could be kept at the maximum reasonable output, but to achieve this the State should make reforms in order to improve the position of the industry, and, so far as sheep and lamb are concerned, it is important also that the consuming public should be asked to do its share in helping, provided it is encouraged to buy more home-produced mutton and lamb by the better presentation of supplies on the market. This latter is precisely the object of the National Mark Scheme, and, as the Committee sees it, the sooner that scheme includes mutton and lamb the better for the country's sheep industry.

(10) The Agricultural Marketing Act, 1931, can be employed in supplying farmers with powers to organize effectively to sell their products to best advantage after these have been graded and marked. It appears to us necessary, also, that imported mutton and lamb should be marked as such, in the same way that good home-produced would be under the National Mark, *i.e.*, either by indelibly stamping the principal parts, or by running a roller stamp down two lines on the outside of each half-carcass. The imported marking should have a distinctive colour and device to show it clearly and to distinguish it immediately from the home produce. Any defacement of marks would, of course, be a penal offence. It should then become impossible for imported mutton or lamb to be sold under an English label, and

substitution, at present illegal but commonly happening, would become a thing of the past.

(11) In this connexion, the following extract from the Ministry's Report is of special interest :—

> To quote a leading member of the trade, many of the housewives of London, in buying Canterbury Lamb, still imagine they are buying lamb of Kentish origin. Nor are many consumers aware that much of the imported lamb and mutton is of South American and not of Empire origin. That substitution of one kind of lamb for another takes place is clearly shown by the frequent prosecutions instigated by the representative of the New Zealand Meat Producers' Board, where an inferior foreign article has been sold as Canterbury or as New Zealand lamb. One result of substitution, so far as the home-killed trade is concerned, is that consumers often prefer definitely to order imported rather than home-killed meat owing to the uncertainty of what would otherwise be supplied at the price of the home-killed article. The Sale of Food Order, 1931, Part III, provides that any imported meat offered for retail sale must be clearly labelled as such, or, alternatively, where all the meat on sale is imported meat, a notice must be exhibited to that effect. It is generally admitted, however, that the Order has failed to put an end to substitution.

(12) There is also the question of the confusion, even within the trade in English meat, between mutton and lamb. Sheep may be bought as "hoggets" and afterwards sold as lamb retail, provided the meat is the right colour and the other characteristics do not show too much of the maturity of the sheep. Under the National Mark Scheme, with possible administrative co-operation by Farmers' Boards under the new Act, it is suggested that there should be distinguishing marks for mutton and for lamb.

(13) On the question of the general desirability of Farmers' Boards, the Report may again be quoted. After referring to the care with which the exports from New Zealand are managed, the Report says:—

> In the marketing of home-killed supplies, on the other hand, there is practically no co-ordination of any kind. Supplies reach the market largely as dictated by the season and the market knowledge of individual producers. As a result, periods of glut and shortage are apt to occur, though many producers are aware of the glut periods that recur regularly—particularly, in the case of English lamb, soon after Whitsuntide, and again during September or October, when the supply of Scotch hill lamb is at its height—and so far as possible avoid marketing their stock at those times. The problem of the home producer, however, is different from that faced by the importer. His product is marketed fresh ; he cannot, therefore, make use of long-period cold-storage to regulate the flow of supplies. Any system of adjusting supply to demand would, therefore, have to operate at the point of sale of the live animal.

(14) Farmers' Boards under the Act would take all possible steps to reduce marketing costs so that home-produced mutton and lamb could be sold at a figure which should be low enough to compete more successfully with the graded and standardized imported commodity. If the price of imported became too low for this to happen after all economies through better organization had been made, then the State should be asked to take some special steps in regard to it.

(15) As regards the kind of Producers' Boards which may be set up under the Agricultural Marketing Act to deal with sheep and

lamb, they could be simply *regulatory* of the industry, leaving *trading* to be done by the present machinery, *i.e.*, it may not be necessary for them, at first at any rate, to take the full powers under the Act. The assent of two-thirds of the registered producers of mutton and lamb would be required before a Board could be set up, and these would have to be producers of two-thirds of the product in the area concerned. Obviously, the larger the area of producers covered by such Boards in the country the more full and complete would be the producers' hold over the marketing of their products. Once the Board is formed, all producers in the area, unless specially exempted, would have to comply with the regulations of the Board and contribute to its working expenses. It is quite clear that the organization of the industry is a matter which only producers themselves can accomplish, and that for the purpose of turning out their product in proper shape under the National Mark and making the best of it, and also of advertising it when they have organized their market, co-operative control, as supplied by the Act, is necessary. At a later stage in the development of organization, a trading body rather than a regulatory might be set up to order the flow of supplies to city markets and the sale of them in those markets to carcass butchers on the basis of their grading under the National Mark and of their dead weight, but in the meantime the regulatory board, or boards, might function simply in improving the general technique of marketing and, particularly, in advertising a standardized product. A levy for publicity of only ½*d.* per carcass on all sheep and lamb sold for slaughter in Great Britain annually would yield about £20,000. It should be remembered that a trading organization with ownership of stock is in a better position for securing credit facilities than is a mere regulatory body. In the United States of America, the National Live-stock Marketing Association, working as a trading organization, deals with no less than two-thirds of the live-stock business of the country.

(16) An example of a Producers' Board which is mainly regulatory is the New Zealand Meat Producers' Board, which not only lays down conditions for the grading, marking and freezing of New Zealand mutton and lamb, but also regulates shipments and freight charges, looks to the proper conditioning of the meat, and also to the general publicity arrangements of the product. It stops short, however, at actually selling the meat. The New Zealand Government grants annual licences to export on the recommendation of the Board and on the conditions defined by it, and no meat may be exported without such licence. It is financed by a compulsory levy, on all exporters, of 1*d.* per carcass, which in the year ended June, 1930, brought in an income of over £36,000. In the year ended June, 1930, over £13,000 was spent in advertising, and during the 1929 season 3,000,000 copies of the Board's booklet on New Zealand meat and over 200,000 placards, etc., for windows of retail shops were distributed in the United Kingdom.

(17) It should be pointed out that Producers' Boards for English, Scotch and Welsh mutton and lamb, besides organizing supplies, would control marketing to the extent that they could ensure that supplies were only handled by or through auctioneers and traders licensed by themselves. They would also remove the anomalies of too many small markets for their product and of too much of it being sent forward to the markets at the same time. Perhaps the most useful part of their activities, however, would be in connexion with improvement in the arrangements for slaughtering. At present, there are scattered over the country probably no less than 16,000 private slaughter-houses, each of which, under general sanitary control, is

a law unto itself as regards methods. If it could be arranged that sheep and lambs destined for the various centres of consumption could be slaughtered at central district abattoirs where the latest scientific methods were used and where the by-products were dealt with on up-to-date lines, a considerable saving would probably result to the industry. At present, skins and fats command low prices because the skins are badly flayed and the fats are not properly treated, and glandular products are usually not treated at all. There is a special industry in imported glandular by-products, but their manufacture cannot be undertaken except where up-to-date methods of slaughtering on a large scale are used. Hence the home demand for these products for medicinal purposes, etc., has to be served by importation.

(18) An important general point, also, is that the concentration of slaughtering which would follow from organization of this kind would enable the prices obtained by the producer for sheep and lambs to be more closely related to the retail prices obtained for mutton and lamb. At present, there is the very substantial margin between wholesale prices (paid to the farmer) and retail prices (paid by the consumer) after reasonable charges and expenses are met. An industry like that of agriculture should not be put into a false position as regards the home consumer by the charging of large and loose overheads against its commodities by the retailer. These do not occur to the same extent with regard to imported supplies, when the wholesale business is in few hands and appropriate retail prices are easily calculated.

(19) Enough has been said to show that the trade in sheep, mutton and lamb requires adjustment, primarily in the interests of producers, and that this adjustment can best be obtained by producers themselves taking a hand. Whilst they are coming to a decision in the matter, the Ministry of Agriculture might proceed with a National Mark for mutton and lamb, exploring also the position as regards the feasibility of definitely marking imported mutton and lamb to show the country of its origin, as suggested in Paragraph 10 of this Report. This would tend to give Colonial and Dominion produce the advantage which it should have over other imported supplies on our markets. The Committee hopes that the other points brought forward in this Report will also receive careful consideration by those chiefly concerned with them.

November 17, 1931.

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APPENDIX II

REPORT FROM THE STANDING COMMITTEE ON THE SUBJECT OF THE AGRICULTURAL MARKETING ACT, 1931

(1) The Ministry of Agriculture has issued an "Orange Book," Economic Series No. 33, explanatory of the provisions of the Agricultural Marketing Act (price 6*d.* net). This book will be very useful to farmers and other producers of agricultural commodities who propose to combine for the purpose of the better marketing of their commodities with the help of the provisions of the Act.

(2) It will be remembered that in October, 1930, the Standing Committee reported to the Council favourably upon the Bill as introduced, and gave a summary of the proposed provisions for the information of members. In that Report, the Committee pointed out how useful the provisions would be in the group-marketing of such commodities as milk, potatoes and hops, in which this country is largely self-supporting, and in others in which the competition from abroad is not too pronounced. It indicated, however, that, in the case of other commodities which can be brought into this country

at low prices and which undersell our home market, the Bill would be of little use unless coupled with a measure of control of imports. The Committee then said that "no amount of combination for marketing or compulsion of minorities will avail where the home market is undersold by imports of agricultural produce from countries where costs of production are lower than in this country, or where subsidies or veiled subsidies are paid." For that reason, the Committee recommended the Council to support a measure for the control of such imports under a scheme which would ensure that they did not undersell a fair home market, and the Council agreed.

(3) The Act has been on the Statute Book now since the end of July, but it is too early yet to record progress, which has also necessarily been somewhat retarded by the course of recent financial and political events. The Committee, however, is informed that there are prospects of applications being made for the approval of schemes under the Act in regard to the marketing of milk. Schemes for beef, hops and fruit are also being seriously considered by certain sections of producers. Schemes in regard to other items of agricultural produce will, no doubt, be considered so soon as producers come to realize collectively the usefulness of combining under the Act. One such possibility in regard to a board, or boards, for the marketing of mutton and lamb is indicated in a separate Report by the Standing Committee now being presented to the Council.

(4) It has not, of course, yet been necessary for the Ministry of Agriculture to ask Parliament to vote any moneys for the establishment of marketing funds, as provided under the Act, for the provision of credit facilities to boards or their constituents.

November 17, 1931.

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APPENDIX III

REPORT FROM THE STANDING COMMITTEE ON THE SUBJECT OF FINANCIAL SUPPORT FOR COUNTY AGRICULTURAL EDUCATION SERVICES

The Standing Committee have had before them the Circular Letters of the Ministry of Agriculture dated September 29, 1931 (T.E. 11797 and T.E. 11749) to County Authorities for Agricultural Education. The Committee recognize with regret the need of economy in the expenditure of national and local revenues under present conditions. Like the Ministry, they feel sure that in the present emergency all Authorities and individuals affected will readily accept the changes that will be rendered necessary by the alteration in national grants to local services of agricultural education to the basis of 60 per cent. of the approved net expenditure.

The Standing Committee would emphasize the hope that all Authorities will do their utmost to secure that the existing system of agricultural education suffers no injury which can be avoided, and that its main structure remains intact. They are of opinion that, in general, the expenditure on agricultural education by Local Authorities has been fully justified, and they would regret any reduction in the extent or the efficiency of these services which could be avoided. They hope that all members of the Council of Agriculture for England, especially those who are members of Local Authorities for Agricultural Education (Education Committees, Agricultural Committees, or Agricultural Education Committees as the case may be), will support the policy of maintaining services of agricultural education at the highest possible level of efficiency.

November 17, 1931.

NOTES ON PRICES AND SUPPLIES*

R. J. Thompson, C.B., O.B.E.

THE pound sterling has weakened during the past four weeks, and in the middle of December imported agricultural produce, both from the Empire and from foreign countries, was costing somewhat more than it was a month ago, though the rise in the price of imported products which would normally follow has been counteracted in the case of several commodities by a fall in prices abroad.

Home produce generally has shown no great change in price with the exception of milk, for which the revision of the contract terms has added 4*d.* per gallon to the retail price of deliveries in December and January. English wheat declined, but fat cattle were in better demand, and well-finished animals brought forward for the Christmas trade realized improved prices, though there was not much change in ordinary grades. Fat sheep and pigs were weak. Cheese, however, is a bright spot, Cheshire advancing to a quite marked extent and Cheddar cheese more moderately. Eggs have been plentiful and values declined sharply. Potatoes showed a further improvement. Feeding stuffs are rather lower than a month ago.

The changes that have taken place in the past month in the prices of some of the principal home and imported products can be seen from the following table :—

	Dec., 1931	Nov., 1931	Dec., 1930
	s. d.	*s. d.*	*s. d.*
Wheat, *Gazette* average, per cwt. ..	6 5	6 10	6 2
,, No. 2 Manitoba	7 1	7 7	6 0
,, Argentine	6 1	7 0	5 8
,, Russian	6 4	7 0	5 6
Fat cattle, first quality, per cwt. ..	46 1	43 0	49 8
Beef, English, N.M. Prime, per lb. ..	0 6¾	0 6½	0 7¾
,, Argentine chilled H.Q., per lb. ..	0 6⅝	0 6⅜	0 7⅛
Fat sheep, first quality, per lb. ..	0 9¾	0 9¾	1 1½
Mutton, English, per lb.	0 7⅞	0 8⅛	0 10⅞
Lamb, New Zealand, per lb.	0 7¾	0 7⅞	0 9
Bacon pigs, first quality, per score ..	9 7	9 10	13 9
Bacon, Danish green, per cwt. ..	50 0	60 0	74 0
Pork pigs, first quality, per score ..	12 5	12 2	18 3
Pork, English, per lb.	0 8	0 8¼	0 11½
Butter, New Zealand, per cwt. ..	113 0	124 0	120 0
Cheese, Dairy Cheddar, per cwt. ..	106 0	92 0	96 0
,, New Zealand ,, ...	68 0	71 6	66 0
,, Canadian ,, ..	73 0	73 0	81 0
Eggs, N.M. Standard, per 120 ..	17 6	25 3	20 3
,, Danish, 18 lb. ,, ..	20 3	21 3	21 3

* Written mid-December.

	Dec., 1931	Nov., 1931	Dec., 1930
	s. d.	*s. d.*	*s. d.*
Potatoes, King Edward, Lincs and Yorks, per ton	209 0	185 0	135 0
Wool, Southdown, per lb. at Bradford	1 2	1 1	1 2
Maize, Argentine, per cwt.	4 5	5 3	4 9

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending December 16, 1931, and in corresponding weeks a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

Wheat.—During October and in the first week of November, wheat prices were very strong, and a substantial rise took place, but subsequently a reaction set in and prices have moved downwards, though so far the decline has not been serious. Taking the Liverpool December future as a guide, the price on December 15 was 5*s.* 0¼*d.* per 100 lb. as against 5*s.* 6*d.* a month earlier, while the *Gazette* average has shown a fall in four weeks from 6*s.* 10*d.* to 6*s.* 5*d.* per cwt. To an appreciable extent, rates in this country have been sustained by weakness in the sterling exchange, domestic prices in the United States and Canada having fallen nearly to the level at which they stood two months ago ; for example, the Chicago December future was quoted on October 15 at 50⅛ cents per bushel, and by November 6 it had risen to 66¾ cents, from which point it declined and registered 55¾ cents on December 15. In Argentina, the drop has been somewhat greater.

This decline is, probably, only temporary, but it reflects the uncertainty of the outlook, particularly as regards the prospects of European countries purchasing up to their estimated requirements. According to the *Corn Trade News*, the total shipments of wheat and flour to all destinations up to the middle of December was nearly the same as last year (37,161,000 qr. against 37,409,000 qr. in 1930), but this total was made up of larger shipments to ex-European countries, chiefly China and the East, while the European total was reduced to 28,551,000 qr. as compared with 31,177,000 qr. in 1930. This reduction may be partly due to somewhat larger crops, as these are naturally drawn on to a greater extent early in the season, but it is also due to the more severe restrictions on importation in several European countries. Italy, for example, which is normally a large importer, passed a law in July, 1931, by which flour must contain 95 per cent. of native wheat. A modification was made on November 1, when the milling ratio for hard durum wheat was reduced from 95 to 75 per cent., and this alteration will tend to increase the Italian requirements of this particular grade, but the

effect of these restrictions can be seen in the fact that imports have so far been reduced to one-fourth, the arrivals at Italian ports from the beginning of August to December 12 being only 1,061,000 qr. as against 4,362,000 qr. in the same period last year. Another feature of the trade this season is that although Germany is on balance a large wheat importing country, her exports up to the end of October were very much heavier than last year, while imports were substantially reduced, there being in fact a net export. This appears to be a consequence of the arrangement whereby bonds are issued on exports enabling a corresponding quantity of wheat to be imported at a reduced rate of duty, and presumably imports will be proportionately larger later on, but for the time being Germany's purchases are lighter.

Apart from the effect of various forms of control, the general financial situation is also bound to have an important influence on the wheat trade. If conditions improve, the requirements should be met at least on last year's scale, and in view of the poor rye crop larger purchases would be probable, whereas if, unhappily, the reverse should be the case, purchasing would be restricted still further.

The future trend of wheat prices is, however, dependent not only on demand and on the supply available from crops now harvested, but also on the prospects of the winter and spring crops in North America, in Russia and in the importing countries of Europe. Little information is so far available, but it is believed that autumn sowings in Europe have been effected under good conditions in most cases and without much noticeable change in area, except in France, where an increased acreage has been sown. In the United States, the area under winter wheat is estimated to have been reduced to 38,682,000 acres, as compared with 40,692,000 acres harvested in 1931. The area in Russia also appears to be smaller.

Shipments from Russia are now being made on a much reduced scale, though the suspension of fresh sales which was referred to last month proved to be only temporary. The new Argentine crop is officially estimated at 27,300,000 qr. as compared with 29,500,000 qr. last year, but this is a first forecast and as weather conditions recently have not been too favourable it may be reduced.

Imports into the United Kingdom in November were again large, and the total for the three months September-November amounted to 9,806,000 qr. against 7,315,000 qr. in the same period last year. Port stocks of wheat and flour on December

1 amounted to 15,814,000 cwt., which is the highest recorded in any month since 1921.

Cattle.—The autumn is usually the worst time of year for selling fat stock, owing to the large number of animals coming off the grass, the result being that markets tend to be over-supplied and prices decline. This year the position has been rather more unsatisfactory than usual from the price point of view, rates for first quality having dropped fully 5*s*. per live cwt. between August and November. On the other hand, the number of cattle coming forward for slaughter has not been quite so heavy as in recent years, the reduced prices having possibly led some feeders who were in a position to do so to postpone selling in the hope that prices would be better at the Christmas markets or after the turn of the year. It is interesting to notice that the imports of chilled beef appear to have been regulated with the object of not overloading the market at the time of low prices, as the imports in the four months August to September only averaged 676,000 cwt. per month, as compared with an average of 828,000 cwt. in the preceding seven months. The proportion was much the same last year, and seems to indicate that shippers from the River Plate, recognizing the tendency for prices to be low in the autumn, aim at lighter shipments at this time of year.

Normally, prices from December onwards should show an upward tendency, though last season, that is, in the early part of 1931, there was little improvement until May. It is, of course, impossible to say how prices will go this spring, but it is worth noting that the numbers of store stock shown at markets this autumn, and also the numbers imported from Ireland, have been about 10 per cent. less than last year. This suggests that the supplies of fat cattle next spring will be on the light side. Another indication is that the number of adult cattle (other than cows) shown in the Returns last June was lower than for several years past, from which it follows that the number of animals available for slaughter this season is likely to be reduced.

In considering the possibility of better prices, however, it has to be remembered that the low general level of the past twelve months has not been the result of any specially large supplies of beef, either home-produced or imported, so that it by no means follows that any slight reduction in home supplies would have much or any effect on prices. What seems to be needed is a decrease in the imports, not so much

of beef itself but of other kinds of meat, which might perhaps have a beneficial effect on meat prices generally. In the past eleven months, the imports of chilled beef have shown only a small increase (about 2 per cent.) over 1930, and have been less than in 1929, whereas other kinds of meat have been received in substantially larger quantities, the increase in mutton and lamb being about 10 per cent. and in bacon 24 per cent.

Although in ordinary circumstances bacon does not compete directly with beef, there is a relationship in price between all classes of meat. If bacon is in heavy supply and cheap, it depresses the price of pork and pork products, and this in turn leads to a reduction in other meats. Cheap bacon also cuts into the demand for beef and mutton by direct substitution. It is believed, however, that the production of bacon on the Continent is now ceasing to be profitable at the low prices ruling lately, so that some alleviation of the recent excessive competition from this source may be expected in due course.

Against this must be put the fact that the importation of frozen lamb is steadily increasing, while the possibility of an extension in the imports of chilled beef cannot be overlooked. At present the beef industry in Argentina is not particularly flourishing, and producers complain bitterly of low prices, but an improvement in the price level might have the effect of drawing out further supplies and stimulating an expansion in cattle raising in Argentina and Uruguay. On the whole, while prospects are uncertain, it seems probable that prices have touched bottom, and some little improvement may be hoped for in the spring.

A feature connected with the seasonal prices for cattle is that while fat stock are usually high in the spring and low in the autumn, the position with store stock is reversed, so that buyers of stores for summer feeding appear to buy dear and sell cheap, while buyers for winter feeding have the advantage of low prices for their stores and then obtain the best prices for them when fattened. This is, of course, mainly the result of the lack of balance which now exists between summer grazing and stall feeding : more cattle are required for fattening on pastures than for winter feeding, so that competition tends to raise the price of stores in the spring and to reduce the price at which these larger numbers can be sold when fat. The difference between the spring and autumn price of stores is not large, but it seems to recur quite consistently every year.

Sheep and Lamb.—Heavy supplies of frozen lamb continue to have a depressing effect on sheep and mutton prices. Australia was expected to ship about a million more lambs this season than last, and in fact this additional number has been despatched in the three months September to November, when shipments amounted to 1,832,000 carcasses against 787,000 in the same period last year. Later shipments are likely to be on a more moderate scale, but this quantity means a large addition to current supplies. The actual arrivals in October and November from all sources, that is from Australia, New Zealand and the River Plate taken together, amounted to 2,143,000 carcasses, an increase of 780,000 over the same period in 1930.

Pigs and Bacon.—Fat pigs continue to be marketed in good numbers, and prices show very little change, though the tendency both in pigs and in pork and bacon is downwards rather than upwards. Imports of bacon in November amounted to 940,000 cwt. and show no variation from the recent high level; of this total, 647,000 cwt. came from Denmark, which was the largest quantity yet recorded in any one month. The killings in Denmark in the last few weeks have been on a more moderate scale, but there is no noticeable change in the general level of supply. In Holland, however, farmers have been advised to restrict breeding, and there has been a distinct fall in slaughterings and consequently in the export of bacon to this country: the reduction is probably attributable to the less profitable character of the trade as exchange rates are much less favourable for Holland than for Denmark.

Potatoes.—The stock of ware potatoes from this year's poor crop will certainly be reduced to very small dimensions in April and May, so that not only are prices likely to be high, but there should be a strong demand for early potatoes as soon as they are available. Any duty imposed on imported new potatoes under the new Act would tend to diminish competition from Spain, the Canary Islands and elsewhere, while France will be entirely out of the market, as the importation of potatoes from that country after March 15 next has been entirely prohibited as a safeguard against the introduction of Colorado beetle. The opening for the planting of first earlies can be judged to some extent from the following figures showing the importation which took place from April to July, 1931, though these are not exhaustive, as small quantities were received from other sources.

	April Tons	*May* Tons	*June* Tons	*July* Tons
Spain	6,126	50,888	15,488	4,167
France	783	3,339	64,182	32,193
Canary Islands	3,348	2,215	3,090	83
Channel Islands	52	1,082	40,752	3,462

To replace the supply imported from France, viz., 100,000 tons, an additional 20,000-22,000 acres would be required, while one would suppose that as much again might be planted to meet the demand likely to exist as a consequence of the shortage of the main crop and to cover reduced imports from other sources. In 1930 the area estimated to have been planted with first early potatoes was 38,700 acres in England and Wales, and 13,100 acres in Scotland, the total production being about 245,000 tons. In 1923-25 the total area under first earlies in Great Britain was 67,300 acres. The chief producing areas are Cornwall and the Scilly Isles, Bedford, Kent, Essex, Hampshire, Cheshire, Lancashire and Lincoln.

Although there is a definite need for increased planting of early potatoes, this does not apply to the main crop. It is not unnatural that after a year of high prices, such as the present, there should be an inclination to increase the acreage, but it should be remembered that this year's prices have been the result of an unfavourable season and not of a specially small acreage. In the present unorganized state of the potato trade a total production in England and Wales of more than about three million tons is almost certain to result in an over-supply and low prices, and, except in bad crop years, this quantity can be produced from an area of about 450,000 acres, which is about the acreage planted in England and Wales in 1931. There is, therefore, no opening for any appreciable addition to the area of main crop potatoes.

Milk.—The variation in the output as between winter and summer has always been one of the major difficulties in milk selling, and one that the agreement between the N.F.U. and the distributors has aimed at solving. In 1922, when the scheme was first started, there was a deficiency in winter milk that necessitated much higher prices in winter than in summer, but these favourable prices so encouraged production that in the course of time the former winter deficiency was apparently converted into a winter surplus. No definite statistics of monthly production or supply are available to show the extent to which this occurred, but it was presumably with the object of checking the further extension of this winter excess that the

whole of the price reduction made in the 1931-32 settlement was concentrated on the six months October to March. Over these months the prices offered represented an average reduction of 4*d.* per gallon, whereas for the summer period the prices were actually slightly increased, with the result that the winter and summer prices became nearly equal. This very drastic reduction—which over the six months would have amounted to 24 per cent.—has had the result of converting the apparent surplus into an actual deficiency ; accommodation milk, which at the end of September was fetching 9*d.* to 1*s.* a gallon, rose to as much as 1*s.* 6*d.* and even 2*s.* a gallon in December, while in order to keep up the supply, milk was imported from Denmark and Holland at, it is said, very unremunerative rates.

This decline in the supply seems to have been due to the poor quality of this season's hay, and to less liberal feeding of the cows on concentrated food, which was brought about by a desire to economize in face of the reduction in the contract price, and accentuated by an increase in the cost of purchased cattle foods which took place at the same time. During the summer, practically all classes of feeding stuffs stood at very low levels, and in September the index number showed the average price of eleven different kinds to be 24 per cent. below pre-war ; shortly after the milk settlement had been concluded, however, values moved upwards so that the index for November was only 3 per cent. under pre-war rates, and although this indicated that feeding stuffs were still comparatively cheap, it represented an increase of fully 20 per cent. over the summer prices : thus, the producer was hit both in the selling price of the milk and in his costs of production.

The revision that was agreed for December and January puts suppliers during these months in practically the same position as last year ; except that farmers who have contracts under Class II (*b*) will only be paid at the full milk price for 85 per cent. of their output in December and for 87½ per cent. in January, whereas under the previous terms 90 per cent. was allowed in both months. They will also suffer some reduction in respect of manufacturing milk, the price of which was fixed at 5¼*d.* per gallon for November and December. This is higher than in any month since January last, but is still below the 5¾*d.* that was obtained in 1930.

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JANUARY ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

THE activities this month are mainly confined to attendance on live stock. There are few opportunities for work on arable land, especially on the heavier soils which at this period are usually both cold and wet. Much damage can be done by ploughing heavy soils in a very wet condition, and unless these soils are to be summer fallowed they should be left until better conditions prevail.

Wheat.—In favoured soils and districts a portion of the wheat crop may be drilled in January, and such a crop is usually regarded as a winter wheat, varieties like Little Joss, Squarehead's Master and white wheats of the Victor or Wilhelmina types being sown. So far as wheat for the 1932 harvest is concerned the main portion now to be sown will be what are commonly termed spring-sown wheats.

The amount of land sown with spring wheats varies very much from year to year, and if a favourable autumn seeding season is experienced less is sown in the following spring.

The wheat area in 1918 consisted of over 10 per cent. of spring-sown wheat, but this was far from normal and in late years the proportion may have been as low as 1 per cent. of the total area.

Inquiries are being made by farmers as to the advisability of sowing spring wheats this year. Every case will require individual consideration. Experiences vary very much from year to year, but as a rule spring-sown wheats do not yield so well as autumn-sown wheats. This is particularly true as regards the heavier soils. Medium loams can give good crops of spring-sown wheat.

During February and March, when suitable soil conditions prevail, varieties like Red Marvel or White Marvel can be relied on to succeed. The land should be well consolidated, be in good manurial condition and seeding should be fairly liberal, at least three bushels of seed per acre being used. A finer surface tilth should be obtained than is necessary for autumn-sown wheat, and if manure is required it should be of a complete character, containing nitrogen, phosphates and potash to encourage growth and hasten maturity. Great care should be exercised in selecting good seed, and it is very important to dress it so as to destroy any bunt. For late

spring-sowing, or on land which is not in high manurial condition, April Bearded Wheat may be preferred. This variety has rather a weak straw and should not be selected for early sowing on good land.

Fattening Cattle.—No branch of farming requires greater skill and business judgment than commercial fattening of cattle. The margin of profit is small and losses can and do frequently occur. The purchase of stores for fattening purposes calls for exceptional ability. Some farmers have an almost uncanny knowledge in this respect, and whilst they have not got a monopoly of this knowledge, and have to pay a good price for the animals they want, yet their judgment is such that they are able to make a success of cattle purchased at a price that the average farmer may think is too high.

In feeding judgment must be used to determine how quickly the animals are to be finished off. If the object is to utilize large quantities of roots and fodder and to make manure there is a good deal to be said for moderately slow fattening. In such circumstances the cattle selected should not be in too forward a condition and would be started on fodder only or roots and fodder, concentrated foods being introduced gradually, always keeping the ration a little better than the cattle. The fodder must, of course, be of good quality and where no concentrates are used at first the fodder should be good quality hay. If cattle are in forward condition when put up to fatten the ration must be correspondingly good, or the animals may lose condition, and whenever this happens the cost of making good the loss may jeopardize any chance of profit.

The eye of the master must be observant. When cattle are grouped in yards or hovels it is important that they should be of equal size and strength; a bully or a timid animal would be better fattened in a stall, tied by the neck. Many stockmen have a real gift for fattening cattle, and when this gift is coupled with experience and observation such men are truly valuable. The even-tempered attendant, quiet in movement and manner, soon obtains the confidence of the cattle, which respond to such attention and rapidly become tame and quiet. As soon as the fattening process begins there should be strict regularity of all feeding and cleaning operations, and ample time and opportunity should be given for rest and quiet. Great care should be taken to avoid scouring, the occurrence of which inevitably interferes with the progress

of fattening. Common causes are overfeeding, due to a desire to push the cattle a little faster; carelessness in measuring the supply of food; a faulty combination of foods; and the use of a particular food that is unwholesome or unsuitable. Change of food when necessary should always be effected gradually. The progress of the cattle may be noted by their quiet disposition, slow consumption of their food, an oily coat and the tendency to lie content practically at all times when not actually feeding.

A good deal can be learned from observing the condition of the droppings; these should never be hard and yet should have enough coherence to avoid any tendency to run and should drop without splashing. There is a characteristic odour about the manure from well-fed cattle that is quickly recognized by those who know. A sour smell is a sure sign that something is wrong.

Sheep.—In the southern counties lambing may take place from October to April inclusive, but the main flocks of arable-land sheep lamb in January, February and March, and the grass-land sheep in March and April. Early lambing, such as takes place this month, calls for a good deal of care and labour, especially in bad weather. A lambing-pen is essential, and flockmasters and shepherds usually show considerable foresight in planning where this should be and providing the necessary accommodation for use both before and after lambing as well as the necessary food crops.

Where the lambing yard is of the nature of a permanent one it is often situated in some sheltered paddock or in a rick yard. A sheltered position not too far off is used for ewes about to lamb; from here they can be drawn into the lambing pen proper.

In the lambing-pen, individual pens or coops, one hurdle square, will be provided into which single ewes will be drafted and where they can be easily observed. After lambing the ewes are moved forward to other well-sheltered pens, and it is usual to use separate pens for double lambs and for singles, and in some ram-breeding flocks the ram lambs go to one pen, so that subsequent feeding can be arranged in accordance with the requirements or intentions of the flockmaster.

As soon as possible ewes should be moved from the main lambing-pen and put on clean land. The food before lambing should be nutritious and not too bulky. It is a mistake to give too many roots, but roots in moderation and in conjunction

with hay and grain should do the ewes no harm. Gentle walking exercise before lambing is important. After lambing feeding can be more liberal, and roots or green crops are very valuable. The lambs should run ahead of the ewes and if early fattening is aimed at the lambs should soon be given an opportunity of access to cake and grain. A fresh fold each day is the ideal.

Fattening sheep should now be pushed on. The bigger sheep should have a more liberal ration in order to get them away fat as early as possible. Small compact sheep tend to fatten the most quickly, but this type will sell well at any time before lambs are plentiful whereas the bigger type are best marketed early. The general tendency is to fatten sheep earlier than hitherto, before they have made their full growth. The older the sheep the more food will be consumed per unit of live-weight increase.

The economy of fattening sheep on arable land crops is intimately bound up with the cropping. The main object of the root crop is to clean the land and maintain its fertility in order to fit it for the growth of cereals. Root crops such as rape, turnips, swedes or kales can be cashed only through the live stock. On good land cash crops such as potatoes or sugar beet can be grown ; on stock farms mangolds may be grown and used for stock-feeding, the manure being returned to the land. On heavy soils bare fallows can take the place of roots. On thin light soils, however, especially where they are remote from stock yards, improvement is best effected by the growth of suitable sheep feed and its consumption on the land, whereby the manure is returned direct and the treading of the sheep gives desirable consolidation to such soils. The use of artificial manures and green manuring may slightly modify the need for rigid adherence to this practice, but the poorer the natural fertility and the thinner the soil the greater are the relative merits of the sheep-folding practice. The real test of the soundness of a practice is whether it is economical. Judgment in buying and selling is a very material factor, and the difference between buying-in and selling-out prices will determine in large measure whether the practice is sound. Even with the best judgment this varies materially from year to year. The use of suitable, economically-grown crops, to be supplemented with hay or concentrates, or both, to suit the circumstances of the class of sheep and the market for which they are being prepared, deserves close attention. A continuation of the practice of feeding sheep on arable

crops not only maintains certain types of soils in cultivation, but provides a market for store lambs that are produced in districts or under circumstances which do not admit of fattening as lamb. This is a clear case of the need for maintaining a balance between grass and arable land.

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NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
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Rock Phosphate in Arable Cultivation.—The use of finely ground mineral phosphates for the improvement of grass land has become fairly general in the wetter parts of this country, where these fertilizers frequently give results similar to those obtained with basic slag. The improvement, however, is somewhat slower, and usually makes itself felt in the second and subsequent years. As regards arable land, much less experience has been recorded, and since it is important to utilize this relatively cheap form of phosphoric acid in any circumstances in which it may be of value, a few notes on experiments with ground rock phosphates on crops other than grass may be of interest. In England from 1845 and more extensively in Scotland from 1877 ground rock phosphates were tried as a manure for turnips with variable but on the whole favourable results, but the earlier introduction of superphosphate and its rapid development, owing no doubt to its more certain and speedy action, caused interest in the direct utilization of rock phosphates to decline. Study of the fertilizing action of mineral phosphates then moved to countries, such as Russia and the United States, which possessed ample natural deposits of phosphate and large areas of soil on which, under an extensive system of farming, phosphate was the chief requirement. The direct use of the ground mineral also appeared a simpler technical problem than the manufacturing process involved in the production of water-soluble phosphate.

In Russia a considerable amount of work has been carried out on the utilization of the various rock phosphates there available. Examination of the effects of rock phosphates on plants in sand culture brought out some interesting points.

(1) Plants differ in their ability to utilize the difficultly-soluble phosphoric acid of rock phosphates. Those that stand out as specially able to derive their phosphate from these sources are lupins, buckwheat, peas, and, to a lesser

extent, mustard. Most of the common agricultural crops have little ability to deal with rock phosphate in sand culture.

(2) The availability of rock phosphates varies according to their types and origin, but the variation is not sufficient to make them really useful to those crops that have little natural power of dealing with insoluble phosphates.

(3) Increasing the application of rock phosphates had very little effect in improving the results.

The above conclusions were reached from studies in sand culture, but when rock phosphates were examined in natural soils it was found that on acid soils and on peaty soils they were more effective and produced increased yields even in those crops that, unaided, could scarcely utilize insoluble phosphate at all. The acidity of the soil being in some way linked with the uptake of insoluble phosphate, it was further found that manures that left an acid residue in the soil after absorption by the plant tended to help the action of insoluble phosphate, and on the other hand the addition of liming materials had exactly the opposite effect and diminished the action of rock phosphates.

Workers in the United States have carried out many investigations on similar lines: availability studies in sand cultures and extensive field experiments on arable crops, some of them maintained for long periods of years. The pot cultures showed, as in the Russian experiments, that crops differed considerably in their powers to assimilate rock phosphate. Buckwheat, lupins, turnips, swedes, mustard and sweet clover stood out as effective users of insoluble phosphate; peas, vetches and lucerne were fairly good; and the cereals were distinctly poor. Their action was increased by fine grinding and thorough mixing with the soil. Different types of American phosphates differed quite markedly in their availabilities, the softer type, such as Tennessee brown rock, being the most effective, but none of them was as active as superphosphate. The addition of lime or chalk depressed the availability of rock phosphate to the plant. The recovery of phosphate in these experiments was always small, and was much less from rock phosphate than from more soluble materials.

As might be expected, the many field experiments in the United States have produced varying results, but on the whole a certain uniformity of behaviour can be detected. On soils markedly deficient in phosphate they have usually given definite increases in arable crops, though not as a rule so

quickly or to the same extent as superphosphate. The addition of organic matter as green manure or dung increased the effectiveness of rock phosphates, while the addition of liming materials decreased it. The recovery of phosphoric acid from phosphate rock is distinctly less than from water-soluble phosphates ; thus in one summary the recoveries were 1.2 per cent. and 8 per cent. respectively. Several extensive summaries of field experiments and farmers' experience have been published, of which that of W. H. Waggaman* is the best known.

In Germany expert opinion appears to be against the use of phosphate rock for general arable purposes. Their most hopeful employment is on acid soils, and especially on acid peats having a high phosphate requirement, where their action is about equal to that of basic slag.

Coming now to the more recent experiments in this country, these have not as yet been very numerous. Most of the trials have been conducted with turnips or swedes, which appear to be here as elsewhere fairly well able to utilize insoluble phosphates. An extensive series carried out at centres in the North of Scotland (1911-13) gave results with ground rock phosphate but little inferior to those obtained with superphosphate. In the Bangor experiments in N. Wales (1914) similar results were obtained. In Northern Ireland, Scott Robertson found that rock phosphates were effective on turnips, but not nearly comparable with superphosphate when used on potatoes, this latter result being also observed in an experiment at Kilmarnock in 1917. Under the conditions at Cockle Park, Northumberland, rock phosphate has been found valuable when applied to temporary leys on a soil on which periodical liming is required. A series of experiments has been started on a four-course rotation at Rothamsted, comparing the first year and residual effects of finely-ground Gafsa phosphate with superphosphate. The results are not yet sufficiently advanced for discussion, but so far as the first year's results were concerned superphosphate was superior to rock phosphate, particularly on turnips, but also on barley and seeds. The soil at Rothamsted is well supplied with lime, and the superiority of soluble over insoluble phosphates was brought out on such land in the early days of the experimental station by Sir John Lawes, in his first experiments on the acid treatment of insoluble phosphates.

* U.S. Dept. of Agric., Bull. 699, 1918.

All the evidence goes to show that ground rock phosphate cannot be regarded in any sense as a rival to water-soluble phosphates for general arable purposes. There is, however, a case for investigating the conditions of soil, climate, and types of cropping that make it possible to utilize this cheap source of phosphoric acid either wholly or in part in our fertilizer mixtures for the arable land.

Cyanamide on Grass.—Comparisons of the fertilizing effect of cyanamide and sulphate of ammonia on arable land have been frequent in recent years, but on grass land fewer trials have been put on record. It is of special interest in this connexion to examine Dr. O. Nolte's summary* of results obtained in Germany over the period 1923-29.

The figures are expressed as kilogrammes of hay produced per kilogramme of nitrogen, supplied in one case as sulphate of ammonia and in the other as cyanamide. They are as follows :—

	Kilos hay per 1 kilo nitrogen.		
Soil type	*Cyanamide*	*Sulphate of ammonia*	*No. of expts.*
Loamy sand	25·3	33·1	28
Sandy loam	29·9	29·7	20
Loam	28·2	32·1	37
Clay and heavier soils ..	20·3	35·1	17
Humus sands	35·9	38·8	54
Average of mineral soils	29·7	34·6	156
Peat (Fenland type) ..	18·9	21·3	11
Peat (Acid type) ..	12·6	18·2	3

The author points out how the action of cyanamide approaches that of sulphate of ammonia on the medium soils of high biological activity, but falls behind on sands, clays and acid peats, where conditions are not so favourable for the chemical and biological changes that cyanamide must undergo before its nitrogen reaches the plant. The performance of cyanamide in increasing the hay crop ranges from 58 per cent. of that of sulphate of ammonia on the heavy class of land to 100 per cent. on the sandy loams, the average in all mineral soils being 86 per cent.

Steamed Bone Flour.—Bone manures have always been a favourite source of phosphate among farmers. No doubt this popularity is in part due to the general use of bones with good effect in the days before water-soluble phosphoric acid was obtainable. Moreover, bones in their untreated condition, or when merely deprived of their fat, provide not only phosphoric acid but from 3-5 per cent. of nitrogen as well—an amount

**Fortschritte der Landwirtschaft*, VI, 1931, p. 513.

quite comparable with that contained in many compound fertilizers. The effect of this nitrogen, which may be considerable, should not be overlooked when comparing bone meal with purely phosphatic manures. The phosphate of bones is only slightly soluble in the soil water, and there is therefore no danger of damage to crops, as sometimes happens with soluble manures, owing to the high concentration of soluble salts arising from an overdose. Bone manures are safe and slow acting, and also lasting in their effects. It must be admitted, however, that even after allowing for the manurial value of their nitrogen, they provide insoluble phosphoric acid at decidedly higher cost than the other phosphates in general use. This is more pronounced in the case of bone meal than with steamed bone flour, whose phosphate costs about the same as the water-soluble phosphoric acid of superphosphate. Precise field trials comparing steamed bone flour with other insoluble phosphates are not very numerous, but for arable crops it does not appear to have done better than superphosphate on calcareous soils or basic slag on acid soil. On grass, however, there are places where it has a very high reputation and seems to be preferred to alternative sources of phosphate. Its very fine state of division, dry condition, and relatively cheap price are all points in favour of steamed bone flour in comparison with other bone manures. It suits light open soils insufficiently supplied with lime, and finds considerable use as a drier for farm-made mixtures of artificials, in which it can be employed at about 10 per cent. by weight. At the same time it provides a lasting source of phosphoric acid that is probably more available than the rock phosphate sometimes used for the purpose.

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PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended December 9				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	8 12	8 12	8 12	8 12	11 1
,, ,, Granulated (N. 16%)	*	8 12	8 12	8 12	8 12	10 9
Nitrate of lime (N. 13%) ..	*	..	..	..	7 2	11 0
Nitro-chalk (N. 15½%) ..	*	7 5*d*	7 5*d*	7 5*d*	7 5*d*	9 4
Sulphate of ammonia :—						
Neutral (N. 20·6%)	*	6 15*d*	6 15*d*	6 15*d*	6 15*d*	6 7
Calcium cyanamide (N. 20·6%)	*	6 15*e*	6 15*e*	6 15*e*	6 15*e*	6 7
Kainit (Pot. 14%)		3 3*h*	3 0	2 14	3 4*g*	4 7
Potash salts (Pot. 30%) ..		5 3*h*	5 0	4 11	5 2*g*	3 5
,, (Pot. 20%) ..		3 13*h*	3 10	3 3	3 14*g*	3 9
Muriate of potash (Pot. 50%)..		9 17*h*	9 11	8 10	9 16*g*	3 11
Sulphate ,, (Pot. 48%)..		12 1*h*	11 15	10 11	12 0*g*	5 0
Basic slag (P.A. 15¾%)‖ ..		2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..		2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..		..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖		2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A. 16%)	§	3 11	..	3 9	2 17*k*	3 7
,, (S.P.A. 13¾%)	§	3 5	2 9	3 3	2 12*k*	3 10
Bone meal (N. 3¾%, P.A. 20½%)		8 15	6 15	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)		5 19*b*	..	6 0	5 5	..
Burnt lump lime		1 4*p*	1 2*l*	1 9	1 19*n*	..
Ground lime		1 9*p*	1 8*l*	..	1 18*n*	..
,, limestone		1 3*p*	1 6*l*	1 7*m*	..	..
,, chalk		..	1 6*l*	..	1 6*n*	..
Slaked lime		..	..	2 9	2 10*n*	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra, for lots of 2 tons and under 4 tons 5*s.* per ton extra, and for lots of 1 ton and under 2 tons 10*s.* extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

g Prices shown are f.o.r. northern rails; southern rails, 2*s.* 6*d.* extra.

h Prices are ex-ship; for delivery from store, kainit and potash salts are 6*s.* and muriate and sulphate 10*s.* per ton extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

l Carriage paid 6-ton lots Knottingley. Ground limestone 100% through standard sieve.

m In bags f.o.r. Liverpool. Fineness 45% through standard sieve.

n Carriage paid 4-ton lots London. In non-returnable bags, prices are 5*s.* per ton extra.

p Carriage paid 6-ton lots Bristol.

NOTES ON FEEDING

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Solages Method of Forage Preservation.—In the *Journal d'Agriculture Pratique*, October, 1931, M. René Fortin discusses the comparative merits of the Solages system of forage preservation and that of ensilage. The Solages system has now been tested in France over a period of some years. It was discussed by Marre in his paper to the World's Dairy Congress in 1928. Marre was of opinion that, in so far as it had been tested then, it was proving of practical value. The method is based upon the use of common salt in preserving fodder, and in essence is as follows. Forage, *i.e.*, lucerne, clover, grass, &c., is cut by the mowing machine in the ordinary way. It is left in the swaths without being touched until it is about three-quarters dry. It is not turned or " tedded " by machines, but when three-quarters dry is collected and loaded on a cart. It is carted into a Dutch barn or built into a stack and in the course of building it is spread out in layers of from 1 ft. to 1 ft. 4 in. thick. When a layer of this thickness has been made, salt at the rate of about 2 lb. per 1 cwt. of forage is spread over the surface of the layer. Then a second layer is made, the process repeated and so on. If the forage is only half dry then the proportion of salt is raised to about 4 lb. per 1 cwt. of forage. The salt, it is said, prevents excessive heating and mouldiness.

It is claimed that the method, while perfectly simple, speeds up the hay-making process, reduces the amount of labour required in hay-making, and enables the farmer to cart his hay into the stack in unsettled weather, before it would be fit to cart for stacking in the ordinary way.

It is claimed also that the forage, since it carries more leaf, is more nutritious than ordinary hay, while the presence of salt is in itself an advantage from the point of view of the nutritional value.

It appears from Fortin's article, however, that the last two hay-making seasons have been abnormally wet (15 days' consecutive rain), and the Solages method has shown certain defects. One infers that there was real difficulty in getting the hay even half dry and that hay only half dry or even more humid, treated with salt, became both musty and dusty. To obtain really satisfactory results, therefore, forage must apparently be reasonably dry—reaching at least the stage

described by investigators as "three-quarters dry." In dry and warm weather this stage may arrive in 24 hours. Such forage treated with salt has proved of high feeding value.

Fortin observes that in Dutch barns or hay-sheds constructed of metal, the salt has attacked and damaged the metal. In order to prevent such damage he recommends that the metal be whitewashed annually.

Results are quoted to show that the salt impregnated in the hay has been beneficial to live stock. It has long been recognized, although sometimes overlooked, that salt is very necessary for the health of farm animals. Salt is an essential constituent of saliva, gastric and other juices. It helps digestion and is necessary for dissolving the proteins. It is a constituent of blood and lymph, and animals deprived of a sufficiency of salt may exhibit various symptoms of malnutrition. Those symptoms may be described as giving an appearance of general unthriftiness. French advocates of the Solages method maintain that the presence of the salt in the forage is of importance to the health of the stock, its value in this respect being secondary only to those other advantages already mentioned —the reduction of the duration of the period of hay-making, and the possibility of the farmer getting hay into the stack when three-quarters dry without waiting for conversion to normally dry hay.

It is of interest, however, to find that advocates of the system now appreciate its limitations in seasons of continuously wet weather. There seems much in favour, however, of employing more generally this practice of salting hay, whether it is three-quarters dry or still drier. There is certainly reason to believe that the presence of salt at the rate recommended reduces the chance of excessive heat and mustiness. The salt is not expensive, and its presence is likely to be of direct benefit in the feeding of stock.

Feeding of Cattle for Market.—During the Christmas show season the attention of feeders is naturally focussed upon the "bringing out" of fat stock in attractive form. During the last decade, not only has the quality of fat cattle at local shows improved appreciably, but so also has the degree of "finish" achieved by successful feeders. It is true, however, that one still finds exhibits that are hardly as evenly fleshed or that do not handle as well as might be; and, although the technique of feeding show cattle is unquestionably becoming more generally understood, there is still room for some improvement. It could be argued that prices offer little encouragement

to feeders to give special care and attention to show animals, but one finds that at local Christmas sales, however low the general run of prices may be, a good quality animal that is well and evenly fleshed, without being "overdone," will generally attract bidders and make a bit above the average price.

It was opportune, therefore, that one of the leading agricultural periodicals should publish recently* an article on beef production by an authority who has personally achieved eminent success in this particular direction. Cridlan has described a technique that in many of its details will be recognized as similar to that practised in the area that has become noted both for the successful exhibition of cattle at fat stock shows, and the week to week provision of prime "Polled Scots" for the London market. Scottish beef producers have favoured their good quality home-grown oats as the staple ingredient of the concentrated ration. English oats, however, are more fibrous and of poorer feeding-value. In the choice of oats for inclusion in a ration for a special purpose, therefore, it is of the first importance that the oats used should be plump, thin-skinned, and of first-class quality. In addition to oats, the other concentrates favoured are bran, flaked maize and linseed cake, all sound foods that experience has shown to be safe and specially suitable.

The programme of feeding is as follows: 6 a.m. cake, corn, a limited quantity of swedes, followed by hay; noon, mash; 4 p.m. same as morning; 8 p.m. same as noon. This programme may be varied according to personal opinion. Certain feeders, for example, prefer to spread the hay over four small feeds instead of two, but the guiding principle is to feed according to the animal's appetite, adjusting the quantity to what the animal will readily clear up. The choice of foods and the control of the quantity of each to be fed daily are important. It is in this connexion that the skill of the feeder comes in. Successful feeding is a gradual process preferably covering the whole of the animal's life. Steady progress with regular exercise, and the feeder constantly guarding against getting the animal "overdone," should result in an even covering of deep firm flesh, provided that the animal selected for preparation has itself the right sort of conformation and has been bred for beef production.

Concentrates for Milk.—The improved price now being paid for milk will encourage milk producers to stimulate their

* *Farmer and Stockbreeder*, December 7, 1931: J. J. Cridlan.

cows by giving them rather more feeding stuffs than was practicable at the low price of milk recently current. Maize, maize-gluten feed, and maize-germ meal still remain cheap. Oats are relatively dear. Of the protein-rich foods those of best value at the time of writing are decorticated cotton-seed meal and decorticated ground-nut cake. A food in itself well balanced for milk production, palm-kernel cake at current prices compares favourably with other balanced foods.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	6 17
Maize	81	6·8	4 12
Decorticated ground-nut cake	73	41·0	8 5
,, cotton cake	71	34·0	7 0

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·51 shillings, and per unit protein equivalent, 1·42 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL.)

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 2
Oats	60	7·6	5 1
Barley	71	6·2	5 16
Potatoes	18	0·6	1 8
Swedes	7	0·7	0 12
Mangolds	7	0·4	0 11
Beans	66	20·0	6 8
Good meadow hay	37	4·6	3 2
Good oat straw	20	0·9	1 11
Good clover hay	38	7·0	3 7
Vetch and oat silage	13	1·6	1 2
Barley straw	23	0·7	1 16
Wheat straw	13	0·1	1 0
Bean straw	23	1·7	1 17

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6*d.* net.

DESCRIPTION	Price per qr. s.	Price per qr. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	—	6 15	0 10	6 5	72	1 9	0·94	9·6
Barley, British feeding	—	—	—	7 0	0 8	6 12	71	1 10	0·98	6·2
„ Persian	25	0	400	7 0	0 8	6 12	71	1 10	0·98	6·2
„ Russian	24	0	„	6 15	0 8	6 7	71	1 9	0·94	6·2
Oats, English, white	—	—	—	7 17	0 8	7 9	60	2 6	1·34	7·6
„ „ black and grey	—	—	—	6 13	0 8	6 5	60	2 1	1·12	7·6
„ Canadian No. 2 Western	23	3	320	8 3	0 8	7 15	60	2 7	1·38	7·6
„ Argentine	19	9	„	6 18	0 8	6 10	60	2 2	1·16	7·6
„ Russian	22	6	„	7 17	0 8	7 9	60	2 6	1·34	7·6
Maize, Argentine	19	6	480	4 12	0 8	4 4	81	1 0	0·54	6·8
Beans, English winter	—	—	—	6 0§	0 19	5 1	66	1 6	0·80	20
Peas, English blue	—	—	—	12 0§	0 16	11 4	69	3 3	1·74	18
„ Japanese	—	—	—	32 10†	0 16	31 14	69	9 2	4·91	18
Dari	—	—	—	8 10†	0 9	8 1	74	2 2	1·16	7·2
Milling offals—										
Bran, British	—	—	—	6 0	0 18	5 2	42	2 5	1·29	10
„ broad	—	—	—	6 12	0 18	5 14	42	2 9	1·47	10
Middlings, fine imported	—	—	—	6 15	0 14	6 1	69	1 9	0·94	12
„ coarse, British	—	—	—	6 0	0 14	5 6	58	1 10	0·98	11
Pollards, imported	—	—	—	5 15	0 18	4 17	60	1 7	0·85	11
Meal, barley	—	—	—	7 12	0 8	7 4	71	2 0	1·07	6·2
„ maize	—	—	—	5 17	0 8	5 9	81	1 4	0·71	6·8
„ „ germ	—	—	—	6 12	0 12	6 0	85	1 5	0·76	10
„ locust bean	—	—	—	5 17	0 6	5 11	71	1 7	0·85	3·6
„ bean	—	—	—	8 0	0 19	7 1	66	2 2	1·16	20
„ fish	—	—	—	15 0	2 14	12 6	53	4 8	2·50	48
Maize, cooked flaked	—	—	—	7 0	0 8	6 12	83	1 7	0·85	8·6
„ gluten feed	—	—	—	6 2	0 14	5 8	76	1 5	0·76	19
Linseed cake, English, 12% oil	—	—	—	9 7	1 3	8 4	74	2 3	1·20	25
„ „ „ 9% „	—	—	—	9 0	1 3	7 17	74	2 1	1·12	25
„ „ „ 8% „	—	—	—	8 15	1 3	7 12	74	2 1	1·12	25
Soya bean cake, 5½% oil	—	—	—	8 12*	1 11	7 1	69	2 1	1·12	36
Cottonseed cake—										
„ „ English 4½% oil	—	—	—	5 17	1 2	4 15	42	2 3	1·20	17
„ „ Egyptian 4½% „	—	—	—	5 7	1 2	4 5	42	2 0	1·07	17
Decorticated cottonseed meal 7% oil	—	—	—	8 5*	1 12	6 13	74	1 10	0·98	35
Ground-nut cake, 6-7% oil	—	—	—	7 15*	1 0	6 15	57	2 4	1·25	27
Decorticated ground nut cake, 6-7% oil	—	—	—	8 5	1 11	6 14	73	1 10	0·98	41
Palm-kernel cake, 4½-5½% oil	—	—	—	6 10†	0 13	5 17	75	1 7	0·85	17
„ „ meal, 1-2% „	—	—	—	6 7	0 14	5 13	71	1 7	0·85	17
Feeding treacle	—	—	—	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	—	6 5	0 14	5 11	48	2 4	1·25	13
„ „ „ porter	—	—	—	5 15	0 14	5 1	48	2 1	1·12	13
Malt culms	—	—	—	5 10†	1 2	4 8	43	2 1	1·12	16
Dried sugar beet pulp (*a*)	—	—	—	4 15	0 6	4 9	65	1 4	0·71	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of November, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if palm kernel meal is offered locally at £7 per ton, then since its manurial value is 14*s.* per ton as shown above, the food value per ton is £6 6*s.* Dividing this figure by 71, the starch equivalent of palm kernel meal as given in the table, the cost per unit of starch equivalent is 1*s.* 9*d.* Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 0·94*d.* A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6*s.* 4*d.*; P_2O_5, 3*s.* 7*d.*; K_2O, 3*s.* 2*d.*

MISCELLANEOUS NOTES

The Agricultural Index Number

THE average level of prices of agricultural produce during November was 12 per cent. above that of the base years 1911–13 as compared with 13 per cent. in the previous month and 29 per cent. at the corresponding period a year ago. Fat sheep were appreciably cheaper during November than in October, while fat cattle also were a little cheaper on the month, but these decreases were largely offset by the advances in potato and wheat prices, and by the slightly increased values for milk. Quotations for eggs and butter continued to show the customary upward seasonal movement.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August..	49	42	44	52	35	21
September	55	43	44	52	42	20
October	48	40	39	42	29	13
November	48	37	41	44	29	12
December	46	38	40	43	26	—

Grain.—Quotations for wheat showed a further substantial advance during November, the average price of 6*s.* 9*d.* per cwt. being 1*s.* 1*d.* higher than in October and the index figure moved upwards by 14 points to 10 per cent. below the level of the base years. A year ago the index stood at 11 per cent. below pre-war and an increase of 3*d.* per cwt. occurred between October and November. Values for oats also displayed an advance, the average price of 6*s.* 10*d.* per cwt. being 8*d.* higher than in the previous month and the index number was 9 points higher at 2 per cent. below the level of the corresponding period in the base years. Barley, however, receded further and the average price of 9*s.* per cwt. showed a fall of 2*d.* with a consequent downward movement of 2 points in the index figure to a level of 6 per cent. above pre-war as compared with 11 per cent. above a year ago.

Livestock.—Values for fat stock showed a further reduction during November, but those for store stock were higher as a

rule. Fat sheep were considerably cheaper during the month under review, the index number showing a fall of 15 points to 13 per cent. above November of the base years, whereas a year ago the index stood at 53 per cent. above pre-war. Fat cattle were a little cheaper on the month, to the extent of about 1*s.* per live cwt., and the index figure moved downwards by 3 points to 15 per cent. above the level of 1911–13. The prices and indices for fat pigs, however, showed no material change. Values for dairy cows were 12*s.* per head higher than in October, this rise being in accordance with the usual seasonal movement and the index figure appreciated by one point to 23 per cent. above the level of the base period. The index for store cattle was unaltered on the month at 18 per cent. above pre-war although prices were 4*s.* per head higher. Store sheep were about 1*s.* per head dearer than in the previous month, but as the rise in the base period was proportionately greater, the index figure showed a fall of 6 points on the month to the level of only 12 per cent. above pre-war. Store pigs were again lower in November and the index number fell by 2 points to 29 per cent. above 1911–13. A year ago store pigs sold at 111 per cent. above pre-war.

Dairy and Poultry Produce.—On average the contract price of milk during November was very slightly higher than in October with a consequent upward movement of 2 points in the index figure to 21 per cent. above pre-war. Butter was a little dearer on the month, but at 5 per cent. above the level of the base period the index showed no change. Quotations for eggs rose considerably during November, but as the rise in the corresponding period of the base years was proportionately greater, the index number fell by 6 points to 23 per cent. above pre-war, as compared with a fall of 23 points to 33 per cent. above pre-war in November, 1930. Cheese was a little cheaper during the month under review and the relative index number showed a fall of 2 points, being 6 per cent. higher than in 1911–13. Fowls were cheaper on the month whereas an increase occurred in the base years, and the index showed a fall of 10 points to 11 per cent. above 1911–13. Ducks were unaltered, but geese were a little dearer, and the combined index for poultry was 3 points lower than in October at 27 per cent. above pre-war.

Other Commodities.—During November a further considerable increase occurred in potato prices, the index figure advancing by 21 points to 131 per cent. above pre-war. Hay was cheaper on the month and in index fell by 3 points to 22 per

cent. above the level of 1911–13. Wool prices showed a further advance during November, and the index, which showed a rise of 3 points, now stands at 21 per cent. below the pre-war level or 4 points lower than in November last year. Apples at an average of 78 per cent. above 1911–13 were dearer both on the month and year. Brussels sprouts, cabbage and celery cheapened during the month under review, but carrots, cauliflowers and onions became dearer. The general index for vegetables showed a rise of 17 points to a level of 36 per cent. above pre-war.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13

Commodity	1929	1930	1931			
	Nov.	Nov.	Aug.	Sept.	Oct.	Nov.
Wheat	24	—11*	—21*	—37*	—24*	—10*
Barley	11	11	Nil	18	8	6
Oats	6	—17*	— 8*	—17*	—11*	— 2*
Fat cattle	33	28	29	22	18	15
„ sheep	53	53	38	31	28	13
Bacon pigs	56	29	— 5*	—10*	—12*	—12*
Pork „	70	50	5	2	3	2
Dairy cows	33	31	25	20	22	23
Store cattle	15	23	31	23	18	18
„ sheep	51	56	40	33	18	12
„ pigs	108	111	32	29	31	29
Eggs	54	33	17	20	29	23
Poultry	43	36	31	30	30	27
Milk	67	57	55	57	19	21
Butter	50	10	10	7	5	5
Cheese	32	16	23	8	8	6
Potatoes	18	46	45	85	110	131
Hay	41	— 7*	—12*	—14*	—19*	—22*
Wool	41	—17*	—31*	—30*	—24*	—21*

* Decrease.

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Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report, issued by the Ministry in respect of the performance under test of a milk-cooling plant, has been printed and published in pamphlet form. Copies of the pamphlet can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2*d.* net, post free, 2½*d.*

No. 35. "Pulsometer" Direct Expansion Milk-Cooling Plant. Submitted for test by the Manufacturers, The Pulsometer Engineering Company, Ltd., Reading.

Travelling Scholarship in Agriculture

THE College of Estate Management offers a travelling scholarship, not exceeding £300 per annum in value, tenable for one year for the purpose of studying agricultural methods in this country or abroad. The scholarship is open to British-born graduates of a British university or other persons holding such qualifications as may be accepted by the Board of Governors. Applicants must be under thirty years of age on February 1 next, and must submit a scheme of study, together with a schedule of the countries in which they desire to travel, and must undertake to follow a profession approved by the College. A knowledge of the language of the countries in which the investigations are to be carried out, while not essential, will be regarded as a qualification. Two testimonials and two references must be furnished by each candidate. Full particulars and application forms are obtainable from the Secretary of the College, 35 Lincoln's Inn Fields, London, W.C.2. The latter must be returned to him not later than February 1, 1932.

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Ensilage

ENSILAGE has now become an important part of agricultural practice in the British Isles, and shows signs of steady development. The termination of the past wet and unsatisfactory season forms a suitable occasion to direct the attention of farmers to the revised edition of the Ministry's publication* on the subject that has just been issued in the new Bulletin series.

The purpose of the publication is to give an account of present-day knowledge of the subject and of the methods practised in this country. Tower silos, clamp silage and stack silage are adequately dealt with, and there are chapters on the feeding of silage, and the chemistry of the product from a practical point of view.

This 2nd edition has been prepared by the two original authors (Mr. Arthur Amos, M.A., and Dr. H. E. Woodman), who have made extensive changes in bringing the work up-to-date, and have added a section dealing with the precautions to be taken when silos are filled.

This Bulletin of fifty pages is attractively bound in a stiff art-paper cover, and should be of great practical value to dairy farmers and stock owners generally.

*Bulletin No. 37, *Ensilage*, obtainable through any bookseller, or from H.M. Stationery Office, price 1*s*. (1*s*. 2*d*. post free).

Studies concerning the Handling of Milk

THE 4th edition of this publication* (by the staff of the National Institute for Research in Dairying, University of Reading) has now been issued in the Ministry's series of Bulletins. In the preface to the 1st edition (1924) the hope was expressed that it would appeal to a wide public, including not only those professionally interested in the subject, but also some at least of the milk-consuming public. That it has done so is sufficiently evident from the fact that it has become necessary to issue this fourth and largely re-written edition. As regards the future the concluding words of the preface, written by Sir A. D. Hall for the 3rd edition, are still apposite: "Still the book is only at the beginning of its mission. Milk is not consumed either in sufficient quantity or in such a condition of cleanliness as to promote, as it might promote, the health and well-being of the people, who cannot afford to be ignorant of how it is produced and distributed, and of how these things might be better done with advantage to producer and consumer alike."

The book of nearly 100 pages has been written in simple language, and the use of scientific terms has been reduced to a minimum so that the subject may be readily intelligible to all classes of readers. The Bulletin should appeal to a wide public—dairy farmers, milk distributors and sellers, medical men, and milk-consumers.

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Mushroom-Growing

UNTIL comparatively recent times the cultivation of mushrooms was considered to be more or less of a gamble: experience, and the knowledge gained as to the causes of failures, make it possible nowadays to grow good crops with a considerable element of certainty. Even the most experienced growers, however, meet with difficulties and sometimes with failures. To assist growers, therefore, the Ministry has issued an illustrated Bulletin,† which, although comparatively short, deals comprehensively with all aspects of the subject; the purchase and use of spawn, the choice and

* Bulletin No. 31, *Studies concerning the Handling of Milk*, obtainable through any bookseller, or from H.M. Stationery Office, price 2*s.* 0*d.* (2*s.* 3*d.* post free).

† Bulletin No. 34, *Mushroom-Growing*, obtainable through any bookseller, or from H.M. Stationery Office, price 9*d.* (11*d.* post free).

preparation of manure, indoor culture, outdoor culture, making and management of the beds, casing or soiling, and outdoor culture in pastures, etc. Special sections are devoted to picking and packing the crop, and to diseases and pests.

The Bulletin, which is mainly the work of Mr. W. M. Ware, M.Sc., of the South-Eastern Agricultural College, Wye, contains 26 pages of text and 8 full-page illustrations on art paper.

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The Milk Supply

IT is axiomatic that the development of agriculture everywhere is largely, if not mainly, a matter of price. If more food is to be produced, the farmer must be reasonably certain of a fair profit, and the worker of a living wage. Neglect of this axiom is bound, sooner or later, to have unpleasant effects. The milk situation has of late provided an example of the difficulties farmers have to face. Owing to low prices for corn, farmers have turned their attention more and more to milk production, one of the few branches in which they have enjoyed a virtual monopoly. Throughout last summer, production was in excess of the requirements of the liquid milk market, and it was evidently anticipated that supplies would continue in the same ratio over the winter. By late autumn, however, there was already an actual shortage in certain districts. This was hardly due to unfavourable weather —unless it was lack of sunshine—for the autumn was unusually mild and grass was everywhere plentiful. The explanation may lie, partly, in the ration. In the first place the autumn flush of grass was probably taken in quantity, and not over nutritious. Further, much of the hay is of inferior quality, and owing to financial difficulties farmers are economizing in feeding stuffs. Lactations that, normally, would be prolonged by the use of cake are being shortened, and dry cows are prematurely "laying off" on grass. The purchase of freshly-calved cows to maintain the milk supply is similarly restricted by the lack of ready money. In short, farmers are cutting their coat according to their cloth. They are working out their own salvation.

Another possible reason for the reduced supply is the fact that summer prices are relatively more profitable than winter prices, and attention, consequently, is being directed to production in the cheaper period of the year. The situation is not without danger both to the producer and the consumer, for the essential interests of producer and consumer are not

divergent. The latter hitherto has not been much concerned about the well-being of British agriculture, and has been interested chiefly in the quality and price rather than in the origin of foodstuffs, the cost of their production, or the chances of their falling off.

Now, however, there is a growing predilection in favour of home produce, and it would be little short of a tragedy if that preference could not be satisfied in such a commodity as fresh milk. It is not in anyone's interest that attention should be further turned in the direction of condensed or frozen milk. It is in the general interest that an adequate supply of fresh, clean, wholesome milk should be available for the public at a reasonable price. The consumer who taunts the farmer with inability to supply his own market shows complete misunderstanding of the situation. Not one class alone of the community can solve the difficulty. Any successful attempt to develop the resources of the land must rest on a basis of good will and co-operation between all the interests concerned—the producer, distributor and consumer.

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Farm Workers' Minimum Rates.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place on Tuesday, December 15.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Cornwall.—An Order continuing the minimum and overtime rates of wages from December 20 (*i.e.*, the day following that on which the existing rates are due to expire) until December 24, 1932. The minimum rate in the case of male workers of 21 years of age and over is 32*s.* per week of 33 hours in the week in which Christmas Day and Boxing Day fall, 42 hours during the weeks in which Good Friday and Whit Monday fall, and 51 hours during any other week. The overtime rates for male workers of 21 years of age and over are 9*d.* per hour on weekdays and 10*d.* per hour on Sundays. In the case of female workers of 20 years of age and over the minimum rate is 5*d.* per hour for all time worked.

Derby.—An Order fixing the minimum and overtime rates of wages to come into operation on December 26, 1931 (*i.e.*, the day following that on which the existing rates are due to expire), and to continue in operation until December 25, 1932. The minimum rate in the case of male workers of 21 years of age and over is 7½*d.* per hour (instead of 8*d.* per hour as at present) for a week of 54 hours, with overtime at 10*d.* per hour for Sunday work. In the case of female workers of 18 years of age and over, the minimum rate is 5*d.* per hour, with overtime at 8*d.* per hour for Sunday work.

Hampshire and Isle of Wight.—An Order continuing the operation of the existing minimum and overtime rates of wages from December 20, 1931 (*i.e.*, the day following that on which the

existing rates are due to expire), until March 5, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* 6*d.* per week of 40½ hours in the week in which Christmas Day falls and 48 hours during any other week within the period of the Order, with overtime at 8*d.* per hour except in the case of the employment of carters, cowmen, shepherds, or milkers, on the work of feeding and cleaning stock, when the overtime rate is 7½*d.* per hour. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour for all time worked.

Norfolk.—An Order fixing the minimum and overtime rates of wages to come into operation on December 27, 1931 (*i.e.*, the day following that on which the existing rates are due to expire), and to continue in force until June 25, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 42 hours in the week in which Good Friday falls, 53 hours in any other week in summer (instead of 50 hours as at present) and 48 hours in any week in winter, with in addition, in the case of teamsmen, cowmen, shepherds and yardmen, 5*s.* 6*d.* per week, and in the case of sheep tenders and bullock tenders, 4*s.* 6*d.* per week to cover employment in connexion with the care of horses and stock. Workers of the special classes named are also entitled to an additional sum in respect of any employment on those duties on Good Friday, except where a day's holiday on full pay is given in lieu. The overtime rates in the case of male workers of 21 years of age and over are 9*d.* per hour on weekdays and 11*d.* per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6½*d.* per hour on weekdays and 7½*d.* per hour on Sundays.

Surrey.—An Order continuing the operation of the existing minimum and overtime rates from December 20, 1931 (*i.e.*, the day following that on which the existing rates are due to expire), until December 24, 1932. The minimum rate in the case of horsemen, stockmen and shepherds of 21 years of age and over is 38*s.* 8*d.* per week of 51 hours in the weeks in which Christmas Day and Good Friday fall and 60 hours in any other week. In the case of other male workers (except casual workers) of similar age the minimum rate is 32*s.* 3*d.* per week of 41 hours in the weeks in which Christmas Day and Good Friday fall, and 50 hours in any other week. Provision is made for variation in the hours in the week in which Easter Monday falls if a holiday is given on that day in lieu of one in the week in which Good Friday falls. In the case of male casual workers of 21 years of age and over the minimum rate is 7¾*d.* per hour, and the overtime rates for all classes of male workers of 21 years of age and over are 10*d.* per hour on weekdays and 11½*d.* per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5½*d.* per hour with overtime at 7*d.* per hour on weekdays and 8*d.* per hour on Sundays.

Anglesey and Carnarvon.—An Order cancelling as from December 26 the existing minimum and overtime rates of wages and fixing fresh rates to come into force on December 27, and continuing in operation until further notice. The minimum rate in the case of horsemen, cowmen, shepherds and hwsmyn (bailiffs) of 21 years of age and over is 35*s.* per week of 60 hours, and in the case of other male workers of similar age, 31*s.* per week of 50 hours, with overtime in the case of all classes of male workers at 9*d.* per hour. In the case of female workers of 18 years of

age and over the minimum rate is 6*d.* per hour for all time worked.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

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Enforcement of Minimum Rates of Wages.—During the month ending December 14, legal proceedings were instituted against three employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	
Chester ..	Sandbach .	1 10 0	—	36 0 0	3
Cornwall ..	Truro ..	0 10 0	—	—	1
Devon ..	Bideford ..	1 0 0	0 17 0	24 12 0	1
		£3 0 0	£0 17 0	£60 12 0	5

In addition, proceedings were also taken at Bury St. Edmunds under Section 9 (3) (b) of the Act for refusing to give information, and a fine of £1 was imposed.

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NOTICES OF BOOKS

The Grey Squirrel. By A. D. Middleton. Pp. 107. (London : Sidgwick & Jackson, Ltd. 1931. Price 4*s.* 6*d.*)

This volume is probably the first to deal competently with the problem of the grey squirrel in this country. Described by enthusiastic but misguided animal lovers as a "pretty little creature with engaging habits," this rodent has come to be regarded by agriculturists and naturalists as one of the most troublesome pests with which they have to contend, and a book of this character is perhaps overdue. The author, whose researches into the question entitle him to be regarded as an authority, brings a mass of evidence in support of the view that an organized campaign against the grey squirrel is necessary, and few competent field naturalists will be found to disagree with this conclusion.

The period of the animal's first advent into this country is uncertain ; but it is safe to assume that its present abundance is the result of introductions made about the end of the last century. The rapidity of its spread has been remarkable, being paralleled in this country only by that of the little owl, another alien likely to achieve a prominent position in the list of our feathered pests. Farmers, fruitgrowers, gardeners, foresters and all whose living is derived from the land have just cause to regard the grey squirrel as an enemy of the first importance. Nothing edible seems to come amiss to it. Fruit, vegetables, flowers, the bark and leaves of trees, the eggs and young of small birds, game and poultry are all acceptable to this omnivorous feeder, and it is unquestionable that the native red squirrel, whose depredations are confined, for the most part, to forest areas, is harmless by comparison.

It may be noted that considerable space has been devoted to the various methods of destroying the grey squirrel, and it is to be hoped that agriculturists who realize this animal's potentialities will do all that they can to effect a reduction in its numbers. One point, however, has not been sufficiently stressed, viz., that the grey squirrel

is quite good to eat. A general knowledge of its edible qualities, coupled with a demand for its fur, might possibly help more towards its reduction than any warning about its habits may do.

The book can be confidently recommended to all who have given thought to the problem with which it deals. It has been carefully written on sound lines. With his thorough practical knowledge of the subject, the author has given the available evidence commendable and painstaking examination.

An Economic Survey of Hertfordshire Agriculture. University of Cambridge: Farm Economics Branch Report No. 18. By R. McG. Carslaw, M.A. Pp. 104. (Cambridge: W. Heffer & Sons, Ltd. Price 2*s.* 6*d.* net.)

This study is based on records collected during the final quarter of 1930, data being obtained relating to 320 farms selected from the 3,300 holdings in Hertfordshire. The method of selection adopted is explained in a preliminary chapter, after which the present situation as it affects the various elements in the agricultural economy of the county is discussed in detail. Capital invested in livestock averaged nearly half the Michaelmas valuation, dairy cattle averaging 55 per cent. of the total livestock. Of the gross farm income 9 per cent. is represented by sales of sheep and wool, and 8 per cent. by poultry and eggs. Last year there was a net decrease of approximately 3½ per cent. in the working horse population, but we are left in doubt as to whether this decrease reflects greater mechanization or reduced intensity of production. Some 56 per cent. of the farmed land is arable, more than half of this area being under cereals. Wheat covers approximately 14 per cent. of the arable acreage and forms the chief cash crop, oats following with 12½ per cent. and barley with 4½ per cent. The two principal cash crops in the fallow shift are potatoes and sugar beet. Crop produce from only one-quarter of the farmed land is cashed direct, the remainder being devoted to the production of fodder for livestock, or seed for the coming year's crops. Of special interest from the practical point of view are sections dealing with the cost of labour, foodstuffs and manure. The Report points out that there is considerable scope for increasing labour efficiency by the modernization of power and equipment. Unfortunately, capital is scarce, and reliable information on the economics of tractors is not always readily available. In the near future, however, we may expect far-reaching developments in the application of electricity to agriculture. The results of this investigation are worth the serious consideration of all who are looking for a solution of some of the problems confronting present-day agriculture.

An Agricultural Atlas of Ireland. By L. Dudley Stamp. Pp. 60, with 33 figs. (London: George Gill & Sons, Ltd., 1931. Price 3*s.* 6*d.* net.)

This volume completes a useful survey of current agricultural conditions in the British Isles. The importance of agriculture in both Northern Ireland and the Irish Free State gives a special interest to the present study. The actual situation in regard to each branch of the subject is made plain at a glance by means of excellent stipple maps and diagrams accompanied by explanatory notes and tables. Irish agriculture presents certain features that are common to other parts of the British Isles, notably a progressive decline in the arable acreage and a corresponding increase of land used for the production of hay or as permanent pasture. The position, however, is accentuated by a climate that has earned for Ireland the name of "Emerald Isle,"

and that renders it practically impossible for farmers to compete with the great grain-growing regions of new lands. The decline in cultivation seems to be fairly general, although mangolds, beans and peas show slight increases in Ulster, and sugar-beet, a post-war crop, in the south. The majority of horses being used for agricultural purposes, it is surprising to find that the number has not declined more rapidly, despite the increasing introduction of tractors and other machinery. With other livestock the case is different, important increases of cattle, sheep, pigs and poultry being recorded for the whole island. The increase in the number of poultry in Northern Ireland from 5,741,184 in 1925 to 8,807,516 last year, is remarkable. The distribution of certain crops and stock shows curious concentrations, which would not always appear to be related to geological and climatic causes. It is evident that much careful labour has been expended in the production of this atlas, and its study should stimulate intelligent and critical research in Irish agriculture.

The Introduction of Farm Machinery in its Relation to the Productivity of Labour in the Agriculture of the United States during the Nineteenth Century. By Leo Rogin. Pp. ix+260. Illus. (Berkeley: University of California Press. 1931. Price $3·50.)

The author of this book has enlivened the somewhat arid study of the development of agricultural machinery by an attempt to correlate it with the output of man units in work on the farm. A study of this kind not only shows how the productivity of labour has increased owing to the introduction of improved forms of machinery, but throws a side light upon a rather neglected reason for rural depopulation in the older countries of Europe. The increased output per man does not have the same effect in a new country like the United States, where frontier conditions have yet hardly been overcome. The availability of improved machines that enabled each individual to cope with a larger area of land merely meant in that country that new areas were brought into cultivation and that the food supply of the world was by so much increased. In the more densely settled countries of Europe, however, the introduction of improved types of machinery and the consequent ability of one man to perform greater amounts of work, necessarily involved the displacement of labour that had been required in the days when all farm work was undertaken by means of manual operations. This study is, therefore, very instructive, in view of the present circumstances of the agricultural industry in most countries of the world. It points to the fact that differing conditions require the development of changing skill amongst the people employed in a farming area. Whereas a century ago the greatest output per man was obtained where the worker had developed a large measure of manual skill in the different operations, the greatest output per man-to-day is obtained where the farm is highly capitalized and many different and complex machines are used. In place, therefore, of the bodily skill required by the agricultural worker of earlier times, the demand to-day is for an engineering ability that is of quite a different order. Mr. Rogin traces the development of farm machinery in America from the middle of the eighteenth century to the present day, and his treatise shows the number of men and the time taken in the different operations required to produce an acre of wheat under the different conditions obtaining at the various periods. The study is closely documented and the contemporary observations on the output of labour at different times have been carefully correlated. The value of this type of work is very great, since it indicates still another angle of approach to a solution of the difficulties that confront the farming community throughout the world to-day.

University of Cambridge Institute of Animal Pathology: First Report, 1929-30. Pp. xvi+237. (Cambridge: W. Heffer & Sons, Ltd. Price 10*s.* net.)

The Cambridge Institute of Animal Pathology was established in 1923, the staff at first being accommodated in the Medical Schools, but in 1926 the Milton Road Laboratories were ready for occupation, and two years later the new School of Pathology was completed. From time to time members of the Institute have published articles on a wide range of subjects in several journals. Now the Director has published a volume of reports on the work carried out during the period 1929-30, and it is evidently the intention that this welcome departure from the earlier method of publication shall be the practice in future.

The work of the Institute consists partly of research of a more or less fundamental character and partly of inquiry into serious outbreaks of disease among farm animals, particularly sheep, and the reports that appear in the publication indicate the scope of work undertaken during the period. The Report contains articles grouped into five sections—filterable viruses, pathology and bacteriology, biochemistry, histology and parasitology.

The filterable viruses represent a group of agents responsible for a number of the most important diseases of animals, amongst which may be mentioned cattle plague, foot-and-mouth disease, swine fever, distemper and also fowl-pox. So minute are the individual entities of these viruses that they will pass through filters that arrest the smallest bacteria, and the highest powers of the microscope are incapable of making them visible.

In this sense they remain "undiscovered," yet their responsibility for causing disease has been known for many years. One characteristic feature of the group of viruses presented a severe handicap to research—none could be cultivated artificially in the Laboratory in any of the media in which bacteria can be induced to grow, and thus provide unlimited material for any purposes for which a particular organism may be required. A supply of given virus could only be obtained by inoculation of a susceptible animal, and the range of species susceptible to a particular virus is usually very limited. Despite these difficulties considerable progress has been made in the preparation of protective sera and vaccines for use against some of the diseases caused by viruses, and these preparations are used on a wide scale in some countries. One of the most recent of these preparations to be introduced into veterinary practice is the fowl-pox vaccine prepared by the Ministry of Agriculture.

Latterly, it has been possible to obtain cultures of certain viruses in media to which embryonic tissue has been added, and in this country the virus of foot-and-mouth disease has been so cultivated (Fourth Progress Report of the Foot-and-Mouth Disease Research Committee, 1931), and at Cambridge the virus of fowl-pox has now been artificially cultivated. By persistent effort, the difficulties encountered by research workers among the viruses are gradually being overcome.

That a bacillus might in certain circumstances be transformed into a different and very minute form capable of passing through a filter was not suspected until it was reported in 1910 that the bacillus of tuberculosis could be recovered after animal inoculation from a filtrate, but the report, after being ignored for some time, has been confirmed by several workers in the past few years. It is too soon to say whether the earlier conceptions of the nature of tuberculosis will have to be considerably revised as a result of this discovery. The Report contains an article on this subject: the results, with the

human type of bacillus, the authors using sputum and fœtal tissues from tuberculous mothers, were negative.

Another interesting article on tuberculosis deals with the identification of the type of organism found in swine. Of 95 cases, 63 were due to the bovine type, 29 to the avian, 1 to the human, and 2 were due to mixed bovine and avian types. This work brings the English statistics of cases examined to 258 of which 65 per cent. were due to the bovine type and 27 per cent. to the avian type of bacillus. The bovine type of infection is contracted by swine from tuberculous cattle either by consuming raw contaminated by-products of the dairy, by running on pastures that have been grazed by cattle, or by yarding with cattle. The precautions that should be taken to protect swine are, therefore, obvious. The avian type is contracted from poultry and, to quote the Report, "pigs and poultry should not be allowed to run together over the same ground."

Experiments in the treatment of parasitic gastritis of sheep were on the whole disappointing, except in the case of *Hæmonchus contortus*, for the destruction of which several drugs are more or less effective, the best for general use probably being copper sulphate, administered with advantage in two doses at short intervals.

Among other articles, the Report contains a study of the blood of cattle and sheep in health and disease and two chapters on vitamins. Brief reference is made to the experiments on vaccination of calves against tuberculosis with B.C.G. vaccine, and the results of this work will be awaited with interest. Some of the articles that appear in the Report have previously been published elsewhere.

Chemistry and Chemical Technology of Animal Substances. *Chemie und Chemische Technologie Tierischer Stoffe.* By G. Grasser. Pp. viii+272. (Stuttgart: F. Enke. 1931. Paper covers, price 16 Rm.; bound, 17·60 Rm.)

This introduction to applied zoochemistry is an attempt to bring under one cover facts collected from the sciences of anatomy, physiology, physiological chemistry and zoology, arranged so as to form a basis for the chemical and technical exploitation of animal products. All classes of animal products are discussed, ranging from cochineal and cantharides to meat and anti-toxins.

In Part I—General (pp. 1-64)—is given an elementary description of the different tissues of the body and their chemical composition. Facts from comparative zoology are included and applied to technical problems, *e.g.*, in dealing with the melting points of fats, it is mentioned that the fats of the cold-blooded fishes are fluid and of warm-blooded animals solid when dead; in the living animal the fat must be fluid in order to be transported in the body. Again, in the discussion of metabolism, it is observed that in birds with a high rate of metabolism the amount of blood to body weight is as 1 : 12, whereas in fish with a slow rate of metabolism it is 1 : 49. In this section a general account of the chemistry of the proteins is included; it is pointed out that most plant seeds contain globulin, while this important protein in the animal body is only held in solution by the presence of sodium chloride, phosphates and other salts.

In Part II—Special (pp. 65-238)—the chemical composition and technology of different tissues are considered. The chemistry of hides and leather production, furs, bones, bone meal, and methods of meat preservation are outlined, and a good account of the fats and waxes from different species is given. Enzymes (pancreatin, rennet, etc.) and the hormones, such as adrenalin and thyroxin, are discussed, although recent work on anterior pituitary is not included. The

technology of eggs (dried eggs, etc.) and milk (condensed, dried, casein), and the chemistry of silk are each treated in detail, while brief accounts are also given of fossil substances of animal origin (bitumen) and by-products such as guano and fish-meal.

References to literature—mostly to text books of chemical technology—are included at the end of each section; but the place of publication is not stated and specific references are not given in the text. The book forms a good general introduction to the subject.

The Use of Fertilizers in Tropical and Sub-Tropical Agriculture. By A. Jacob, Ph.D., and V. Coyle, M.Sc. Pp. 272. Illus. (London: Ernest Benn, Ltd. 1931. Price 10*s.* 6*d.*)

The need of efficient substitutes for farmyard manure is especially urgent in tropical countries, where cattle are not kept in the same manner as in temperate zones. The high concentration of artificial fertilizers forms an additional advantage in lands where problems of transport and labour are acute. The object of the present brochure is to provide the planter with experimental data concerning the effect of these fertilizers on various crops and soils in tropical and sub-tropical regions, and to aid him in determining his own particular requirements. There are numerous illustrations and tables, and references to literature on the subject.

Honeycraft in Theory and Practice. By J. A. Lawson, F.E.S. Pp. xii+228. Illus. (London: Chapman & Hall, Ltd. 1931. Price 6*s.*)

Written by a bee-keeper who is also an entomologist, this book aims at presenting in clear and simple language the most up-to-date methods of honey production. Part II, entitled "Honeycraft in Practice," contains chapters on "The Hive," "Handling Bees," "Stocking the Hive," "Swarming and Its Prevention," "Waxcraft," "Diseases," "Introduction of Queens," and other aspects of the subject. There are 52 illustrations and a brief bibliography.

The Weekly Weather Report (March 2, 1930-February 28, 1931). Vol. XLVII. Pp. 72. (His Majesty's Stationery Office. Price 15*s.*)

This volume, issued by the Meteorological Office, gives weekly mean values of temperature, rainfall and sunshine, with deviations from the normal, for the period March 2, 1930, to February 28, 1931. Following the new arrangement inaugurated in Volume XLV, the data for each of 57 stations, well distributed over the British Isles, are given for the 52 weeks on a single page, thus permitting the course of the seasons in a single locality to be readily followed. In addition, mean values for each of the 12 districts into which the British Isles are divided for climatological purposes are given in separate tables.

Farm Management Research Technique. By R.McG. Carslaw, Ph.D. Pp. viii+232. *Reports of the College Travelling Scholars in Agriculture*, No. 2. (London: College of Estate Management, 35 Lincoln's Inn Fields, W.C. 2. Printed for Private Circulation. 1931.)

This book is a survey of the organization and technique of farm management research in each of the countries where it has been developed. It has been made possible by the award to the author of a Travelling Scholarship by the Governors of the College of Estate Management, to whose enlightened policy it is a tribute.

Among European countries Germany was the first in which farm accounts were prepared as an aid to farm management by a central office, and a great development in co-ordinated farm accounting has

taken place in that country since the War. The different methods employed and the use of the statistics obtained are fully described. Similarly, the work that is being done in Switzerland and Denmark is amply illustrated by the story of its origin and a criticism of its methods and results.

Methods of research have, however, been tried out most completely in the United States of America, and chapters II to VI deal exhaustively with the experience obtained in that country, where full cost studies, financial accounts and the survey method have all been extensively used, and where a wide interest is taken in the work of the Farm Bureau—Farm Management Service by the farming community. Dr. Carslaw's work will be of great interest to all workers in the field of agricultural economics.

The Land Value Tax, 1931 : A Guide to Valuation Assessment and Procedure in England and Wales. By R. Strachan Gardiner, F.S.I. Pp. 60. (London : Central Landowners' Association, 7 Charles Street, St. James's Square, S.W. 1. Price 1*s.* 6*d.* net.)

This pamphlet is designed to assist landed proprietors in dealing with questions that may arise in connexion with the valuation of their properties and the assessment thereof for the purpose of the new tax. Although mainly intended for the owner of agricultural land, the pamphlet also discusses the bearing of the Act on real property generally. In order to facilitate reference, the text of Part III of the Finance Act, 1931, has been added as an appendix. As stated in the preface, the pamphlet is purely technical and explanatory, and is not concerned with policy or politics.

Baillière's Encyclopædia of Scientific Agriculture. Edited by H. Hunter, D.Sc. Two vols., $6\frac{1}{2} \times 9\frac{1}{2}$. Pp. xvi+1362. Plates 29, figures 44. (London : Baillière, Tindall & Cox. Price 63*s.*)

The object of this work is to place at the service of the farmer and scientific investigator such results of research as are capable of direct application to the various branches of agricultural and horticultural practice. Some 80 experts of recognized standing in this country and abroad have contributed the main contents, and they present in concise and readable form a useful survey of the existing state of knowledge in regard to the many subjects under discussion. While detailing the advances that have been made by means of scientific investigation, they also review the mass of information contained in technical journals and brochures not always readily accessible to the general reader. A valuable feature is a section devoted to agriculture in the Dominions and other parts of the Empire, with special reference to the lines that developments may be expected to follow in the future.

The work is arranged in alphabetical order, cross references linking relevant subjects. Arable and pasture crops, improvements resulting from the propagation and circulation of pure stocks, plant diseases, the value of fungicides as a means of control, Mendelism, and current lines of cytological research are among the matters discussed at length. There are useful articles on refrigeration and the canning of vegetables and fruit, and these should assist current practice.

The introduction states that the space allotted to each subject has been determined by the extent to which it has been the object of research rather than by its relative economic importance. The omission of any account of agricultural machinery, or of the various breeds of livestock, is justified on the ground that these topics already possess ample and up-to-date literatures of their own, but this would

seem to be equally true of poultry and other subjects, which receive detailed treatment. Necessarily a work of this character has its limitations, but the Encyclopædia covers in comprehensive fashion most of the points which interest farmers, research workers and others concerned with agriculture.

The Soil: An Introduction to the Scientific Study of the Growth of Crops. By Sir A. D. Hall, K.C.B., F.R.S. Pp. xvii+388. Illus. (London: John Murray. Fourth Edition. 1931. Price 9*s*. net.)

It is eleven years since the third edition of this work was published and, in the interval, the study of the soil has received greatly increased attention. As a consequence of the extensive research and experimental work that has been carried out throughout the world in this interval, it has been necessary that the book should be largely re-written and re-arranged. Since the book must be regarded as a standard work on the subject, it is perhaps unnecessary to give details of its contents, the essence of which must be already well known, but it will suffice to say that every consideration has been given to the increased knowledge of the subject that has been made available; and that in spite of the modesty of its author in suggesting that it is possible that the conclusions presented may even now be in process of revision owing to work that is going on, it is nevertheless, for the moment, a final summary of our present knowledge of the soil.

Some Aspects of Meat Distribution and Consumption. By A. Jones, B.Litt., B.Sc., and S. M. Makings, N.D.A. Pp. 93 Midland Agricultural College Survey Studies, No. 2. (Sutton Bonington: Midland Agricultural College. 1931. Price 2*s*.)

This report, with a foreword by Mr. A. W. Street, Assistant Secretary of the Ministry of Agriculture and Fisheries, is a study based on conditions in Loughborough in 1930. Loughborough is a town of some 27,000 inhabitants, and obtains most of its home-killed meat supplies locally on the hoof via its cattle market. The proportion of home-killed to total supplies of meat consumed is about two-thirds in the case of beef, rather more than one-half in the case of mutton and lamb.

After a description of the flow of supplies into the town, the Report deals with three main aspects of marketing—retail distribution, volume of consumption of various classes of meat at different seasons and by different occupational groups, and consumers' preferences.

The section on retail distribution consists mainly of a classification of shops according to weekly turnover. It is suggested that a weekly turnover per shop of less than 500 lb. of meat, dressed weight, is uneconomic, and that increasing economy is attainable up to at least 5,000 lb. In Loughborough, the most common type of shop is one handling between 750 and 1,500 lb. per week. A large proportion of the distributors operate with one home-killed beef carcass as the basic weekly unit. There would appear, therefore, to be room for an increase in efficiency in this respect. An interesting fact that emerges is the tendency on the part of the larger-scale units to specialize in either home-killed or imported meat.

As regards consumption, the chief conclusions reached are the elasticity of demand for meat shown by the volume of consumption at different wage-levels, the growing popularity of imported early lamb, and the tendency for consumers to prefer lean meat and small joints. From all these observations, the Report draws the obvious conclusions as to the possibility of increasing the demand for the home product.

The Report is the result of a careful and intensive study of conditions in a very small area. As the foreword points out, however, it has "a wider significance than merely that of presenting the problems of the particular town with which it is concerned. Certain factors in consumer-demand can only be measured by making observations in a number of sample cases, and the same procedure is necessary if a general view is to be obtained of the machinery of distribution as a whole and its suitability or unsuitability to the task which it has to perform."

The Scientific Aspects of Rabbit Breeding. By J. N. Pickard and F. A. E. Crew. (Bradford and London: Watmoughs, Ltd., 1931. Price 6*s*., post free 6*s*. 6*d*.)

This book is the first serious attempt that has been made in this country to arrange the data relating to the genetics of the rabbit, supplemented by subsidiary breeding and management recommendations. Research work on the heredity of rabbits is being carried out by Dr. Pickard, under Professor Crew, at the Animal Breeding Research Department of Edinburgh University. The result of the joint efforts of these two workers is the production of this handy volume, which should become the standard work on the subject. Written in simple language and with a glossary appendix, the book should appeal to the practical rabbit breeder as well as to those interested in pure genetics.

The authors begin with a brief chapter on the history of rabbit breeds, passing on to the physiology of reproduction, breeding practices and growth. Then follows the main part of the book, opening with an account of the Mendelian theory of inheritance. Subsequent chapters deal with coat colours, the breeding of new varieties (with special reference to the Rex), multiple factors, Dutch and English breeds, and linkage, sex and sex ratios, fur types, the Angora (a particularly interesting chapter to the fur farmer) and miscellaneous breeding problems. The final chapters are devoted to nutrition and general management. In the appendixes appear a list of identified coat characters, which, in conjunction with the text, should prove valuable for reference. The bibliography is particularly useful.

This book should be read by all rabbit and other fur animal breeders, and we have little doubt that it will also find a place on the bookshelves of those who are interested in inheritance generally.

The Soils of Berkshire. By N. H. Pizer, B.Sc., A.I.C. Pp. 141. Illustrated with maps and diagrams. Bulletin XXXIX. (University of Reading: Agricultural Office, 1931. Price 5*s*.)

The county of Berkshire has long been known as an area devoted to arable cultivation, but, unlike other areas of the kind, the proportion of arable has been reduced in favour of pasture during the past few decades. The incidence of this change can be studied in a number of agricultural surveys of the county published at intervals during the past 100 years, and Mr. Pizer's work is the latest addition to our knowledge of the subject. It is true that the standpoint from which the earlier surveys were made is different from that of Mr. Pizer's work, but there cannot fail to be a measure of similarity in the information supplied by surveys of farming from whatever point of view they may be made.

The meticulous accuracy of the modern method of soil survey was, of course, unknown in the early and middle years of the nineteenth century, and consequently we have here a more exact study than was possible in those days. The publication of the official agricultural statistics also enables a modern investigator to supply definite and

accurate information in the place of estimates based upon the opinions of local inhabitants.

The Soils of Berkshire is the third study of county soils to be published by the University of Reading. The first was the survey of the soils of Dorset by Dr. C. Luxmore, published in 1907, and the second was the study of the soils of Buckinghamshire, which was published in 1929. The present study maintains the high standard of those previously issued.

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SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

Some Pointers in Farm Management. *J. Wyllie.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 278-283.) [63.191.]

Does Higher Farming Pay ? A Study in Depression and Farming Standards. *A. W. Ashby.* (Welsh Jour. Agric., VII (1931), pp. 5-18.) [338.1.]

Mole Draining. *C. Davies.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 296-299.) [63.12.]

A Comparison of Cup-Feed and Force-Feed Cereal Drills. *C. Davies.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 243-266.) [63.17 ; 63.31.]

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Horticulture

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NOTES FOR THE MONTH

The Warble Pest

It is conceded that the warble pest is more than a nuisance: it is a cause of serious financial loss to several industries, and it has been estimated that stockowners, butchers, and the leather industries suffer annual losses of £400,000 to £500,000. It is also becoming known, largely as a result of demonstrations organized by County Agricultural Committees, assisted by grants made by the Leathersellers' Warble Fly Committee, that the parasites can be easily destroyed, at very low cost, where they lie under the skin of infested cattle.

The Agricultural Education Sub-committee of the Worcestershire County Council has conducted trials and demonstrations in the control of the pest from 1928 to 1931, and during the last two years the work was carried out on a considerable scale, some 10,000 cattle being involved.

In order to destroy the maximum number of warbles, four dressings in a season are necessary, and the dates recommended by Mr. R. C. Gaut, County Agricultural Organizer, in his interesting final report on the operations, are as follows:—

First dressing	March 17-19
Second dressing	April 14-16
Third dressing	May 12-14
Fourth dressing	June 16-18

Possibly in other parts of the country the parasites are liberated from the skin a little earlier or a little later than in the Midlands, and the dates of treatment could be slightly advanced or retarded accordingly, but those quoted give an indication of the time when treatment should be begun, and are a guide as to the intervals between the dressings.

Excellent results have been obtained by the use of a derris-root preparation, and in these trials a proprietary derris powder was used. This is the prescription:—

Derris powder	1 lb.
Soft soap	½ lb.
Water	2 gall.

The soft soap is dissolved in one quart of water by adding the soap to the water in a saucepan and raising the temperature to boiling point. The liquid is cooled by adding about a pint of water, and is then poured slowly over the derris root in a bucket, stirring at the same time until all particles are thoroughly wetted and no lumps remain. The wash, made up to 2 gal., is now ready for application. It should be freely applied with a small piece of cloth to every warble lump, the scabs covering the breathing holes of the parasites being rubbed off so that the dressing may penetrate. It is unnecessary to apply the dressing where there are no warbles.

Some workers prefer the derris formula that was originally used, namely :—

Derris powder	1 lb.
Soft soap	¼ lb.
Water	1 gal.

The results of the treatment in 1930 were judged by the number of warbles found in the 1931 season on the animals treated in the previous year, compared with the number found on animals brought to the herds since the conclusion of the previous year's work. The results are very encouraging:—

	Animals treated in 1930	New cattle
First dressing. Average number of warbles	2·5	5·0
Second ,, ,, ,, ,,	2·7	4·6
Third ,, ,, ,, ,,	1·8	3·0
Fourth ,, ,, ,, ,,	0·8	1·0

This represents an average of 7·8 warbles per animal among those dressed in 1930, compared with 13·6 on the newly purchased stock.

This result was obtained at a cost in materials of about 1½*d.* per head for the four dressings.

Stockowners who decide to treat their animals should not overlook the desirability of treating any warbled cattle bought during the season immediately on arrival at the farm, to prevent the escape of maturing warbles before the next routine treatment is due to take place.

Farmers are urged to treat their cattle and to persuade their neighbours to treat theirs also, as the best results will not be obtained unless the practice is general over wide areas.

* * * * * *

The following note has been communicated by Mr. James Line, M.A., of the School of Agriculture, Cambridge :—

A Weed Form of White Mustard Having a Dark Seed

White Mustard has not usually been regarded as a weed plant of any importance, although commonly grown in this country for its seeds and for ploughing-in as a green manure. Professor Percival, in his well-known *Agricultural Botany, Theoretical and Practical*,* remarks of this plant : " When grown for seed, it does not occasion any trouble as a weed in subsequent crops after the manner of black mustard, as its seeds all germinate at once when conditions are favourable, and the young plants are then readily destroyed."

For some years past, observations have been made on a form of white mustard which is almost indistinguishable from the cultivated plant and has been acting as a troublesome weed on many of the light and medium chalky soils near Cambridge. The weed plants are, perhaps, rather more prostrate and branch more freely than the cultivated form, but the leaves, the flowers and the seed pods of the two forms appear to be identical. The seeds of the weed form, however, although of the same size as those of the cultivated crop, are invariably of a greyish-brown or almost black colour, thus marking them off sharply from the clear yellow commercial seed. The plants of this weed form (as of the cultivated mustard) can be readily distinguished from charlock plants, which they resemble, by their deeply-lobed leaves and their seed pods, which are bristly, and end in a flattened, curved beak as long as the pod. They are more liable than charlock to damage by frost, and are rarely found during the winter months, but the two often grow up together in the spring. The seeds appear to germinate at intervals during the summer, so that several crops of the weed may appear in a single season. The plant is usually called " charlock " by farmers, but one local farmer of great experience stated that he had known it for many years, under the name of " warlock," as a distinct weed over a wide area. On light, chalky soils he considered it to be a more troublesome weed than charlock, especially in spring-sown crops. The weed has often been observed growing up persistently in turnip and rape crops all through the summer, even after repeated pulling and hoeing in the spring. Land ploughed after sainfoin, two years down, often produces a large crop of this weed mustard.

* 4th Edition, 1910, p. 383.

In samples of mustard seed, also in cereal samples, received at the Official Seed Testing Station, Cambridge, seeds of this dark-seeded mustard have appeared as impurities with increasing frequency during the last few years. A note drawing attention to these seeds was published in the *Seed Analysts' Bulletin** in May, 1931, and throws some light on the past history of the dark-seeded White Mustard. The correct name appears to be *Brassica alba var. melanosperma* Alefeld. It has been described under this and other names by Continental botanists, but there appears to be no reference to it in any British publication. As stated in the note above-mentioned, the dark seeds are known to the trade as Bastard Mustard, and their presence seriously reduces the value of a sample of mustard, whether it is intended for seed purposes or for the manufacture of the condiment, as it is impossible to dress out the dark seeds. The mustard manufacturers state that, when milled, the dark seeds render the product "specky."

Plants in the flowering state were sent to Kew for identification, and were named without hesitation "White Mustard" (*Brassica alba*), with the added note—"colour of seeds variable." I am indebted to the Director at Kew for the two following references to the plant. Schulz† describes the variety as having "all or most seeds in the pod brown or obscurely brown-violet, the hilum white"; and indicates further that it occurs "everywhere with the type and the other varieties, especially among wild plants." Alefeld,‡ in his original description, says: "Fruit roughly hairy; seeds black, noticed many times, cultivated and found to come true to seed."

This last fact has been observed in the field by the writer for several years, and although there is a good deal of variation in shade between the seeds of wild plants, every plant so far examined has produced nothing but dark seeds. Experiments are in progress to determine whether any of the seedlings from the wild plant, when self-pollinated, give rise to yellow-seeded forms. It has already been stated that the dark seeds germinate more slowly than the yellow seeds, and that they can remain for a year or two, at any rate, dormant in the soil. It is hoped that further experimental evidence on this last point will be available shortly.

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* Published by the Ministry.

† Schulz, *Pflanzenreich*, IV, 105, 1919, p. 131.

‡ Alefeld, *Landwirth. Flora*, 1866, p. 250.

Mole Draining Demonstrations, 1932

Derbyshire.—The first of the series of mole draining demonstrations arranged by the Ministry for this winter was held on January 13 and 14 on the land of the Grassmoor Colliery, near Chesterfield, Derbyshire.

The following machines were shown :—

MOLE DRAINERS

Ransomes, beam and new wheeled types (Ramsomes, Sims & Jefferies, Ltd., Ipswich).
Harper and Stedman (Harper & Stedman, Ltd., Lewes).
Darby, two implements (Sidney C. Darby (Wickford), Ltd.).
Howard (J. & F. Howard, Ltd., Bedford).
Stevenson (George Stephenson & Sons, Ltd., Newark-on-Trent).
Two Wells mole drainers were also demonstrated.

MOLE DRAINING OUTFIT

Wallace, with Fordson tractor and winch (John Wallace & Sons, Ltd., Hendon).

TRACTORS

Marshall, single-cylinder diesel (Marshall, Sons & Co., Ltd., Gainsborough).
Garrett, four-cylinder diesel, roadless (Richard Garrett & Sons, Ltd., Leiston).
Fordson—with winch outfit (The Ford Motor Co., Ltd., Dagenham).
Massey-Harris, four-wheel drive (Massey-Harris, Ltd., London).
International Trac tractor (The International Harvester Co. of Great Britain, Ltd., London).
Case roadless (The Associated Manufacturers' Co. (London) Ltd.).
Cletrac " 15 " Crawler (Cowan, Hulbert, Ltd., London).

The direct-drawn implements were used in a field of old grass. Water was standing in most of the furrows and the " grip " presented to the tractors was therefore poor, but in spite of the difficult conditions the implements were pulled at an average depth of 14 in. The track-laying tractors were worked up that portion of the field having the greater fall.

The mole draining outfit worked in an adjoining field of maiden " seeds," drawing 3-in. drains at a depth of 19–18 in., direct from a ditch at the lower end of the field. One 5½-in. drain was drawn for demonstration purposes only.

All drains ran well, and it was noticed on the morning after the demonstration that, in spite of rain in the night, water was not standing in the furrows.

Cambridgeshire.—The University Farm, Cambridge, has been selected as the centre for the third demonstration, which will take place on February 10 and 11. The approach to the site is through the Gravel Hill farm buildings of the University Farm, and these are situated about ¼ mile from the main Cambridge-Huntingdon road. The field is approximately three miles from Histon Station and four miles from Cambridge Station.

The local arrangements for this demonstration are in the hands of the Organizer of Agricultural Education, County Hall, Cambridge.

* * * * * *

THE following note has been contributed by the National Institute of Agricultural Botany :—

Varieties of Cereals for Spring Sowing

Thanks to the work carried out in recent years, every farmer in the Midlands, East and South of England can obtain the facts about all varieties of importance, either through the Agricultural Organizer for his county or from the National Institute of Agricultural Botany. The catalogues are still overloaded with names, some of them synonymous, but the number of varieties worth growing is comparatively small.

Wheat.—The wheat quota proposals are no doubt responsible for a number of inquiries that reach the Institute for "a good spring wheat." Unfortunately spring wheat is rarely a profitable crop and is always a gamble. When circumstances compel spring sowing, Little Joss is likely to give the best results if it goes in before the end of February; Red Marvel or A1 offer the best choice for the first half of March, and thereafter April Bearded. To sow later than the middle of April is to court almost certain failure.

Oats.—Oats are a different question. Several excellent varieties for spring sowing are available. Victory is an all-round variety, as useful for sale as for feeding on the farm. Star is a later introduction that has all the merits of Victory with the addition of a better-standing straw and thinner husk. Golden Rain and Golden Rain II deserve consideration for feeding purposes. Finally, the stiff-strawed coarse-grained Marvellous usually gives heavy crops if sown early in February. It should not be used for later sowings.

Barley.—Barley growers will welcome a new variety this season from the well-known Warminster breeder, Dr. Beaven. This barley, known as Golden Archer, is of the Spratt-Archer type, but it yields rather better. Its grain has a golden hue; it is of much the same malting quality as Spratt-Archer. It deserves a thorough trial in all malting-barley districts. The two varieties that have formed the bulk of the crop in recent years, Plumage-Archer and Spratt-Archer, are now so well established that re-affirmation of their merits is superfluous. Farmers will not go wrong in choosing either of them. Where sowing is unusually late, the early-ripening variety Victory deserves consideration.

A leaflet describing these varieties can be obtained free of charge through Agricultural Organizers or from the N.I.A.B., Cambridge. Whichever variety is chosen, early sowing almost always pays. English-grown seed gives just as good results as imported seed, if the standard of purity and germination is the same. Germination should receive special attention in view of the bad harvest conditions of 1931, and farmers are reminded that they can have seed tested by the Official Seed Testing Station, Cambridge, at the nominal fee of 6*d.* per sample.

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The Sex-Linked Method in Poultry Breeding

MOST poultry keepers are aware of the research work carried out by Prof. Punnett and others at Cambridge University. This work has shown that certain external characters of poultry chicks, easily distinguished at birth by an ordinary observer, are related to sex.

This knowledge, which enables the poultry breeder to distinguish with certainty the sex of the chicks of certain crosses on the day that they are hatched, is recognized as of distinct value, not only to the breeder, but also to the vendor and purchaser of day-old chicks.

The Ministry's publication on the subject has now been revised by Prof. Punnett and re-issued as Bulletin No. 38.* Opportunity has been taken to refer to recent developments, including the "Cambar," a new breed that automatically exhibits sex-linkage. The stock of this breed is at present in the hands of the Ministry and is being worked up in order to increase its fecundity.

The Bulletin indicates a number of the most suitable matings, and contains two coloured plates that clearly show for eight different crosses the difference in appearance of the male and female chicks at hatching.

* * * * * *

Nutrition Abstracts and Reviews

IN the issue of this JOURNAL for August last appeared a note describing the arrangements made for the issue of a new journal designed to collect abstracts of all papers having a bearing on nutritional problems. The first (double) number of *Nutrition Abstracts and Reviews* has now appeared, covering the literature from January to June, 1931.

In their editorial foreword the Editors set out briefly their

* Bulletin No. 38, *The Sex-Linked Method in Poultry Breeding*, obtainable through any bookseller, or from H.M. Stationery Office, price 9*d.* (10*d.* post free).

aims and methods. Their object is to enable workers in the many fields of the science of nutrition to keep themselves informed regarding advances in knowledge in other fields, and to enable those engaged in the practical application of the science to learn what advances have been made in fundamental research upon which practice is based. Some 450 periodicals come under direct review and others are reviewed by corresponding editors abroad, the imposing list of whom at the beginning of the volume inspires confidence that the ground will be thoroughly covered. On this point the Editors state that it has been thought advisable in doubtful cases to err upon the side of inclusion.

The great bulk of the volume is, of course, occupied by the actual abstracts, which have been arranged in six main sections: (1) Technique, (2) Composition of Food-stuffs, (3) Physiology of Nutrition, (4) Dietetics, (5) Feeding of Animals, and (6) Diet in Relation to Health and Disease. There follow a few pages of book reviews and an author index. Including the book reviews, there are no fewer than 1,334 numbered abstracts.

To the intelligent layman the most interesting part of this publication will doubtless be the three reviews or special articles that precede the abstracts proper. It is understood that such reviews are to be a regular—and welcome— feature of the new journal. A number will deal with the present state of knowledge of different aspects of the subject, giving a bibliography of the literature. Others will be articles of a more general nature stating a point of view. All three reviews included in the initial issue are intentionally of the latter type.

In the first of these, entitled "Nutrition and Human Welfare," the President of the Royal Society develops the theme of the importance of nutrition in determining the health, the capacity, and the effective qualities alike of a race and of an individual. Descended from a frugivorous phylum, man has experienced two great changes in the form of his nutrition: first when he became carnivorous, and again when he learnt to practise agriculture. It is, however, only within recent years that the application of scientific discoveries has affected practical dietetics; and scientific research in recent years has, in fact, wholly changed the outlook in the domain of nutrition. In brief, the change has consisted in the increasing emphasis upon the qualitative aspect of nutrition. It is now realized that the absence of factors that add practically nothing to the bulk of a dietary may leave the whole entirely inadequate.

Actual disease, enfeebled condition falling short of disease, liability to infection by bacteria, even the feebleness of fundamental instincts such as maternal care for the progeny—all these may depend upon the lack of some minute nutritional deficiency.

In the next paper, entitled "Some of the Difficulties in the Quantitative Assessment of Human Diets," Professor Cathcart (Glasgow) opportunely calls attention to the fundamental importance of the quantitative aspect of nutrition, quoting with approval the axiom of Bayliss, "Take care of the calories and the protein will take care of itself." He goes on to deal with the difficulties that lie in the way of reaching an authoritative standard for the quantitative intake of the average man, and to describe the method that he has found by many years' experience to be the only reliable method, viz., the collection of a sufficiently large number of family diets by means of definitely controlled visitation by a skilled investigator. The method is described in some detail, together with certain difficulties inseparable from it. The fact that dominates all others is the purely arithmetical one of the assessment of the family coefficient. The general practice of using the man as a unit, and designating all other members of the family in terms of a fraction of man, has, apart from other weaknesses, the fundamental difficulty that all men are by no means equal in their energy requirements. Moreover, there is no scale that has been internationally agreed upon and that could thus, even although wrong on the absolute scale, form the basis of real comparative studies. The determination of a set of reasonably accurate family coefficients is quite possible, however, and the author hopes, in a later communication, to put forward actual figures.

The title of the third paper, "The Qualitative Aspects of Nutrition," is a sufficient indication of its main thesis. In it Dr. Orr, Director of the Rowett Research Institute, Aberdeen, gives a broad outline of the new knowledge to which reference was made by the President of the Royal Society. The new studies have, in the first place, called for a new technique, namely, clinical observations upon the effects of diet upon the rate of growth and state of health of animals. Studies in this modern aspect of nutrition are thus to a large extent studies of food in relation to health. Lack of vitamins and mineral deficiency are uncommon conditions in the rations of farm animals in this country, and it is only when animals are fed indoors for intensive production, or are grazed upon un-

improved pastures markedly deficient in one of the minerals, that definite deficiency diseases result. Far more common are various conditions of malnutrition due to minor deficiencies in diet. Here there is a wide field in urgent need of investigation. Again, there is sufficient evidence, although the subject is obscure, to warrant us in accepting as a working hypothesis the view that animals suffering from malnutrition due to an inadequate diet may be more susceptible to some infectious disease than animals in perfect health. Here again is a field of research of great economic importance, in which the problems involved are of the utmost complexity and will require for their solution the combined efforts of the physiologist, the immunologist, and the clinician. Further, since health and production are really only two aspects of the same thing, the correction of deficiencies in their ration renders animals more efficient as transformers of their food into the desired animal product. Finally, it is pointed out that the administration of vitamins and minerals is not necessarily beneficial in itself, but only in relation to a ration deficient in these factors, while the final objective is the perfectly balanced ration in which all the essential constituents are present in the right amounts and the right proportions.

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Home-Wheat Quota Proposals

A CONFERENCE on the Government Home-Wheat Quota proposals took place on January 12 between Sir John Gilmour, Minister of Agriculture and Fisheries, and the representatives of the following organizations: National Farmers' Union, Central and Associated Chambers of Agriculture, Joint Committee of Scottish N.F.U. and Scottish Chamber of Agriculture, National Poultry Council, National Association of British and Irish Millers, National Association of Corn and Agricultural Merchants, National Federation of Corn Trade Associations, National Association of Flour Importers, and the Parliamentary Committee of the Co-operative Congress.

A revised quota plan, which had previously been circulated to the organizations for confidential examination, was fully discussed.

There was general agreement that the scheme was workable, and the Conference agreed to set up a small committee to co-operate forthwith with the Ministry of Agriculture in settling the details of the scheme, which, subject to Government approval, will be embodied in legislation.

IMPORT DUTIES ON FRESH FRUIT, FRESH VEGETABLES AND FLOWERS

THE Minister of Agriculture and Fisheries has made a first Order under the provisions of the Horticultural Products (Emergency Customs Duties) Act. The Order, which is dated December 24, 1931, and imposes duties as set out below, came into operation on Tuesday, January 5, 1932.

The Order, which has been published as Statutory Rules and Orders, 1931, No. 1,098, can be purchased from H.M. Stationery Office, price 1*d.* net.

	Duration	Amount of duty
Fresh Fruit :—		
Cherries	May 1-June 30 (inclusive) ..	3*d.* per lb.
Currants ..	May 1-July 31 (inclusive) ..	2*d.* per lb.
Gooseberries ..	May 1-June 30 (inclusive) ..	½*d.* per lb.
Grapes (Hothouse)	January 5-June 30 (inclusive)..	4*d.* per lb.
	July 1-December 11 (inclusive).	2*d.* per lb.
Plums	June 1-August 15 (inclusive) ..	14*s.* per cwt.
Strawberries ..	April 1-May 31 (inclusive) ..	2*s.* 6*d.* per lb.
	June 1-15 (inclusive)	6*d.* per lb.
Fresh Vegetables :—		
Asparagus ..	January 5-February 29 (incl.)..	1*s.* per lb.
	March 1-May 31 (inclusive) ..	4*d.* per lb.
Green Beans ..	January 5-June 30 (inclusive)..	1½*d.* per lb.
Broccoli & Cauliflowers	January 5-March 31 (inclusive)	4*s.* per cwt.
	April 1-June 30 (inclusive) ..	3*s.* per cwt.
Carrots	April 1-June 30 (inclusive) ..	1*d.* per lb.
Lettuce ..	January 5-April 30 (inclusive) .	8*s.* per cwt.
Endive ..		
Chicory (Salad)	May 1-June 30 (inclusive) ..	6*s.* per cwt.
Cucumbers ..	March 1-June 30 (inclusive) ..	12*s.* per cwt.
	July 1-November 30 (inclusive)	8*s.* per cwt.
Mushrooms ..	January 5-December 11 (incl.).	8*d.* per lb.
Green Peas ..	January 5-March 31 (inclusive)	14*s.* per cwt.
	April 1-June 30 (inclusive) ..	9*s.* 4*d.* per cwt.
New Potatoes ..	January 5-February 29 (incl.)..	18*s.* 8*d.* per cwt.
	March 1-31 (inclusive)	9*s.* 4*d.* per cwt.
	April 1-30 (inclusive)	4*s.* 8*d.* per cwt.
Turnips	April 1-June 30 (inclusive) ..	1*d.* per lb.
Flowers, etc.		
Cut Flowers in the following varieties :—		
Anemones		
Carnations and Pinks ..		
Heather ..		
Marguerites	January 5-December 11 (incl.)..	2*d.* per lb.
Marigolds		
Mimosa ..		
Narcissi (Polyanthus types)		

	Duration	Amount of duty
Flowers, etc.		
Cut Flowers in the following varieties (contd.):—		
Star of Bethlehem ..	January 5-December 11 (incl.) ..	2*d.* per lb.
Stocks ..		
Violets ..		
Plants in flower		
Foliage (excluding Asparagus foliage) ..		
Other Cut Fowers	January 5-December 11 (incl.).	9*d.* per lb.
Flowers attached to Bulbs		
Asparagus foliage		
Rose Trees ..	January 5-April 30 (inclusive) .	30*s.* per 100

The Minister of Agriculture and Fisheries has issued a further Order under the same Act. This Order, which has been published as Statutory Rules and Orders, 1932, No. 16, can be purchased from H.M. Stationery Office, price 1*d.* net. It is entitled The Horticultural Products (Emergency Customs Duties) No. 2 Order, 1932, and is dated January 21, 1932. The Order imposes duties as follows :—

	Duration	Amount of duty
Tomatoes	June 1-July 31 (inclusive) ..	2*d.* per lb.
	August 1-October 31 (inclusive)	1*d.* per lb.

* * * * * *

FRUIT-GROWING IN CHESHIRE

W. E. SHEWELL-COOPER, Dip. Hort. (Wye), N.D.H.,
Horticultural Superintendent for Cheshire.

FRUIT-GROWING in Cheshire is as yet in its infancy, but the acreage under fruit shows a general increase every year, and the writer is continually receiving inquiries about the possibilities and profits of this branch of horticulture. Mainly with the object of satisfying inquirers, it was decided to go carefully into the matter and, for the purpose of a practical investigation, a typical 5-acre plot was chosen, comprising part of a fruit farm for which accurate accounts were kept. The writer is indebted to the owners of this farm, Messrs. H. C. Groome & Co., of Guilden Sutton, for their courtesy in supplying all the necessary figures and for giving him facilities to study the whole problem on the spot.

Particulars of the Farm : *Soil.*—The farm in question was started in the autumn of 1919, the soil being a heavy glacial drift over Bunter sandstone. It had been a dairy farm and, according to local farmers, had a bad reputation for heaviness and poorness.

Draining.—The whole of the land had to be drained at 8 yards apart, the mains being 4 in. and the sub-mains, 2½ in. The drainer was paid 1*s.* a rod, the owners supplying the pipes, skimming off the turf and filling in the trenches.

Initial Cultivation.—The land was in very poor heart when taken over, and full of scutch and other perennial weeds. It would have been better, as the owners now agree, had the land been cleaned thoroughly for a year before planting, but the planting was carried out immediately. As a result, the cost of cultivation in the two years following was as high as £60 a year.

Manuring.—No farmyard manure was ploughed in before planting, but a very good mulching was given to every tree, and 50 loads were distributed over the five acres. This, the writer considers, is an excellent practice, which should be followed by planters to-day. The manure used was found on the farm when bought, and this accounts for its low cost.

Lime was applied after the land was ploughed, at the rate of 2 tons per acre. Quicklime, when the farm was started, cost £2 0*s.* 6*d.* per ton, delivered on the farm.

Fencing.—The orchard was fenced on three sides of the plot only, one side being left open to a field which has subsequently been planted. Posts, 6 ft. long and 5 in. diameter,

were driven in 18 ft. apart, having been creosote-dipped a day or so before erection. Twenty rolls of 4 ft. 6 in. wire netting were found necessary, the bottom foot being buried below ground to prevent the burrowing of rabbits. Two strands of barbed wire were run round the fencing, one at the top of the posts and the other at the top of the wire-netting. This ensured a strong fence and gave protection against cattle, etc.

Planting.—Tree (purchased at 2*s.* 6*d.* each), chiefly two-year-old, were planted on the 15 ft. square system, interplanted with one-year-old black currant bushes (Seabrook's Black) at 7 ft. 6 in. between both trees and rows.

Varieties.—The varieties of apples planted were Bramley's Seedling, Grenadier, Lord Derby, Bismarck, Cox's Orange Pippin (many of which have since been grafted with Ellison's Orange), King of the Pippin, Worcester Pearmain and 12 Monarch trees. Varieties of pears were as follows: Fertility, Conference, Williams (bought as Dr. Jules Guyot), with twice as many Pitmaston Duchess and a few Clapp's Favourite. Criticisms of varietal choice, in the light of present-day knowledge, are included in the summary below.

All the trees were staked with single 4 ft. by 2½ in. diameter larch stakes, the driven ends of which had been previously creosoted.

Buildings.—Farm buildings had to be adapted for fruit-farming purposes, and the cost of such adaptations and repairs appears in the balance sheet each year. In the allocated rental of the 5-acre plot, a fair proportion of the rental value of the buildings is included.

Subsequent Treatment.—Every year, ploughing has been carried out between the trees with a Seabrook's plough; one ploughing up to the trees in the autumn, thus leaving a centre channel for drainage, and one ploughing away from the trees in the spring. Further cultivation between the rows is now done with a Simar Rotatiller, the cost of which is included in cultivations and in tool depreciation in the figures of the last four years.

Spraying.—As science has found new methods, so the system of spraying has been altered to agree with them. Previous to 1923, lime-sulphur was sprayed in the late winter, but, in 1924 and 1925, a proprietary fluid was used as well for a summer wash. In 1926, Messrs. Groome changed over to tar-distillate spraying, the spraying costs being thus reduced to £6 per year. In 1929, it was found necessary to spray the

quick hedges as well as the trees, to prevent re-infection by aphides.

In 1929, also, certain varieties, such as Worcester Pearmain and Bismarck, received a summer spraying of lime-sulphur. In 1930, however, lime-sulphur spraying was general, but there was little increase in the cost on account of the work being done with a motor sprayer. As will be seen, a share of the cost of the machine is debited to tools in this year.

Thinning.—During the past four years, thinning has been carried out on most varieties, but the total cost of thinning cannot be debited to that particular operation, as apples picked when thinned cannot be picked again. The final picking is reduced and made easier. Thus, at a rough estimate, half the extra labour needed should be debited to the thinning and half to the picking.

Manuring.—Once the land was got into good heart and the trees grew well, there was little need to manure heavily with nitrogen. The black currants had to have farmyard manure every year; this is one of the great disadvantages of using them as an intercrop. Latterly, however, sulphate of potash has been applied at the rate of 2 cwt. per acre, as a preventive rather than because there were definite signs of potash starvation.

Picking.—The picking of black currants has been done by casual female labour, the cost being at an average rate of 1*d.* per pound. The apple and pear picking is done by day labour.

Marketing.—From 1921 to 1926, all the fruit grown was sold to local shops and to salesmen who called at the farm. In 1926 and 1927, saleman's wickers were used, and the apples and pears were dispatched to Liverpool and Leeds. In 1928, bushel "Veneer" square containers were used, but the apples were not wrapped. In 1929, the standard bushel box was adopted and the fruit sold under a special mark, all the apples being wrapped. It is interesting here to note that, at the beginning of this season, no wrapping was done, but, as the result of a demonstration at the Cheshire School of Agriculture, wrapping papers were purchased and an immediate rise of $\frac{1}{2}d.$ per lb. was obtained on two similar lots in the same consignment.

In 1930 the National Mark was adopted and has proved a great success. For two years, some boxes of Messrs. Groome's apples have been bought for export. The fruit is sent, according to grade and variety, to the following markets :—Manches-

TABLE I.—COSTS AND

	1919-30			1921			1922			1923		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
*Interest on capital, land and buildings	19	0	0	19	0	0	19	0	0	19	0	0
Share of repair building a/c.	5	0	0	5	0	0	5	0	0	5	0	0
Share of horse and labour	10	0	0	10	0	0	10	0	0	10	0	0
Depreciation of tools	5	0	0	5	0	0	5	0	0	4	0	0
*Original draining	5	2	10	5	2	10	5	2	10	5	2	10
*Original ploughing, etc.	1	0	0	1	0	0	1	0	0	1	0	0
*Original fencing	9	0	0	9	0	0	9	0	0	9	0	0
*Original tree stakes	1	9	0	1	9	0	1	9	0	1	9	0
*Original manure	3	6	8	3	6	8	3	6	8	—		
*Original lime	3	16	0	3	16	0	3	16	0	3	16	0
*Yearly application, manure and lime, etc.	—			12	0	0	15	0	0	21	0	0
*Labour, spraying	—			—			7	8	0	18	0	0
* „ pruning	—			0	9	6	11	0	0	12	0	0
* „ picking	—			7	9	0	8	15	0	10	5	0
* „ ploughing, hoeing, etc.	—			51	0	0	68	0	0	102	0	0
*Spraying materials	—			—			5	18	0	7	0	0
Packages, packing and carriage	—			1	7	0	8	4	6	10	0	0
Total costs	62	14	6	135	0	0	187	0	0	238	12	10
												STATE
*Sales, black currants	—			7	11	1	91	5	4	91	16	0
* „ apples and pears	—			—			6	9	2	1	11	6
Appreciation, black currants	—			22	17	0	22	16	6	22	17	0
„ apples and pears	—			20	10	0	20	10	0	20	10	0
Gross returns	—			50	18	1	141	1	0	136	14	6
Less depreciation, black currants	—			—			—			—		
Net returns	—			50	18	1	141	1	0	136	14	6
Less costs	62	14	6	135	0	0	187	0	0	238	12	10
Deficit	62	14	6	84	1	11	45	14	0	101	18	4
Surplus	—			—			—			—		

Entire net surplus over 10

*The above figures are actual. The remainder are abstracted from

ter, Leeds, Glasgow, Bolton and Liverpool, the last-named receiving the bulk of the apples.

Cox's Orange Pippin, and the "Extra Fancy" perfect grades of other good dessert varieties, were packed and marketed in trays in 1930, being dispatched to Liverpool.

Carriage.—It will be noted that the costs for carriage are fairly high. The plot is 2½ miles from the station and carriage to and from the railway is done by car and trailer. A proportion of the depreciation is included in these costs.

General.—The detailed account (Table I) shows the costs and returns, year by year. For ease in reckoning the correct profit and loss, and to avoid the inclusion of an initial cost,

RETURNS, 1919-30.

1924			1925			1926			1927			1928			1929			1930		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
19	0	0	19	0	0	19	0	0	19	0	0	19	0	0	19	0	0	19	0	0
5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
8	0	0	8	0	0	7	0	0	7	0	0	7	0	0	6	0	0	7	0	0
5	0	0	5	0	0	4	0	0	7	0	0	6	0	0	5	0	0	10	0	0
5	2	10	5	2	10	5	2	10	5	2	10	5	2	10	5	2	10	5	2	10
1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
9	0	0	9	0	0	9	0	0	9	0	0	9	0	0	9	0	0	9	0	0
1	9	0	1	9	0	1	8	0	1	8	0	—			—			—		
—			—			—			—			—			—			—		
3	16	0	3	16	0	—			—			—			—			—		
16	0	0	18	0	0	18	0	0	20	0	0	19	0	0	22	0	0	17	0	0
22	0	0	6	0	0	11	0	0	11	0	0	13	0	0	15	0	0	14	0	0
24	0	0	27	0	0	42	0	0	52	0	0	55	0	0	72	0	0	68	0	0
12	0	0	15	0	0	18	0	0	24	0	0	20	0	0	26	0	0	32	0	0
99	0	0	102	0	0	98	0	0	101	0	0	98	0	0	85	0	0	90	0	0
10	0	0	8	0	0	18	0	0	18	0	0	26	0	0	27	0	0	33	0	0
26	0	0	28	0	0	27	0	0	55	0	0	58	0	0	135	0	0	104	0	0
265	7	10	261	7	10	283	10	10	335	10	10	341	2	10	432	2	10	414	2	10
MENT.																				
260	16	0	255	0	0	352	0	0	560	0	0	319	0	0	262	0	0	240	0	0
26	0	0	32	0	0	108	0	0	232	0	0	212	0	0	341	0	0	322	0	0
22	16	6	22	17	0	—			—			—			—			—		
20	10	0	20	10	0	20	10	0	20	10	0	20	10	0	20	10	0	20	10	0
329	6	6	330	7	0	480	10	0	812	10	0	551	10	0	623	10	0	582	10	0
—			—			27	12	0	27	12	0	27	12	0	27	12	0	27	12	0
329	6	6	330	7	0	452	18	0	784	18	0	523	18	0	595	18	0	554	18	0
265	7	10	261	7	10	283	10	10	335	10	10	341	2	10	432	2	10	414	2	10
—			—			—			—			—			—			—		
63	19	8	68	19	2	169	7	2	449	7	2	182	15	2	163	15	2	140	15	2

years, £945 4*s.* 11*d.*

complete accounts and are as true as is possible to tell.

all the costs are spread over a number of years. The initial lime dressing has been debited over a period of six years; the draining and original ploughing-in of the grass over 20 years; the original farmyard manure over 3 years; the fencing over 12 years; and the tree stakes over 8 years. As to the valuation of trees and bushes, a suggestion of the Ministry of Agriculture, in use at the Cheshire School of Agriculture, has been followed (Table II). This consists in gradually increasing the value of apple and pear trees up to 7*s.* 6*d.* each at the end of ten years, and bringing the black currants up to a value of 1*s.* each at the end of five years, then depreciating them down to zero at the end of the tenth year.

The total valuation has not, of course, been included in any one year, but the annual appreciation has been included on the "return" side—quite the fairest method.

Other points that should, perhaps, be mentioned in connexion with the profit and loss account as are follows :—(1) the very heavy expenses in connexion with marketing in 1930, approximately a quarter of the total expenses; (2) the heavy yield of black currants in 1927, actually the second year in which the bushes were being definitely depreciated.

Summary.—The costs and returns sheet (Table I) shows clearly that, at the end of ten years, there was a total profit of £955 4*s.* 11*d.* on the five acres, or £19 per acre per annum. Considering that the orchard is not yet in full bearing, this is a very satisfactory position.

Varieties.—Of the varieties of apples planted, Bramley's Seedling, Pitmaston Duchess and Lord Derby have not yet produced much fruit, but may bear heavily during the next ten years. Cox's Orange Pippin is a gamble in Cheshire, and cannot be regarded as a regular cropper. King of the Pippins should not be planted now; it is not a first-class dessert variety, and tends to be too small for modern methods of packing.

Bismarck, a coloured cooker, is a problem. Mr. W. P. Seabrook has shown* that it gave him a higher receipt per acre than any other cooking variety, yet at the Cheshire School of Agriculture, on account of its susceptibility to scab and mildew, 40 Bismarck trees have been top-grafted with Ellison's Orange. Further, it is well known that a coloured cooker is less popular in the Northern market than a dark-green one. Had other and better varieties been planted, it is possible that a larger profit would have been obtained over the ten years.

The most successful apples have been Monarch, Grenadier, Worcester Pearmain and Ellison's Orange; and the best pears—Williams, Conference and Fertility.

Clapp's Favourite is a poor cropper, and is not so esteemed on the market as the name might imply.

Present-day Costs.—Table III shows the comparative costs of planting a similar 5-acre orchard to-day. The figures have been supplied by Messrs. Groome, who are planting further acres every year. It will be realized that the present-day costs are in no way comparable to those of ten years ago. Against this, however, we have the very high prices ruling for black currants in 1922-25, compared with those at the present time.

*Lecture at the Farmers' Club, February 4, 1929.

TABLE II, SHOWING ANNUAL CHANGES IN VALUE OF TREES AND SHRUBS.

Initial cost in 1919–20	Valuation									
	April, 1921	April, 1922	April, 1923	April, 1924	April, 1925	April, 1926	April, 1927	April, 1928	April, 1929	April, 1930
	£ s.	£ s. d.	£ s. d.	£ s. d.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Apple and pear trees— £140	160 10	181 0 0	201 10 0	222 0 0	242 10	263 0	283 10	304 0	324 10	345 0
Black currant bushes— £23 16*s.*	46 13	69 9 6	92 6 6	115 3 0	138 0	110 8	82 16	55 4	27 12	—
Appreciation on apple and pear trees ..	20 10	20 10 0	20 10 0	20 10 0	20 10	20 10	20 10	20 10	20 10	20 10
Appreciation on black currant bushes ..	22 17	22 16 6	22 17 0	22 16 6	22 17	*Deprec.* 27 12	*Deprec.* 27 12	*Deprec.* 27 12	*Deprec.* 27 12	*Deprec.* 27 12

TABLE III.—INITIAL COSTS FOR 5 ACRES, 1919, COMPARED WITH 1930.

	1919 £	s.	d.	1930 £	s.	d.
Draining, at 8 yards, 4 in. mains, 2½ in. sub-mains	102	16	3	80	0	0
Ploughing, cultivating and harrowing	20	0	0	8	0	0
Liming	22	16	0	12	0	0
Farmyard manure	10	0	0	10	0	0
Trees : 920 apple and pears at 2*s.* 6*d.* each	115	0	0	69	0	0
Cost of stakes : single, 3 ft.	11	10	0	7	13	4
Planting, staking, marking out	35	0	0	23	0	0
Black currant bushes	13	16	0	13	16	0
Fencing :						
Posts and barbed wire (1 strand on post and 1 half way down)	55	2	6	36	0	0
Wire netting, 20 rolls, 1½ in. mesh.	41	0	0	20	0	0
Erecting above	11	0	0	9	0	0
Totals	£438	0	9	£288	9	4
Per acre	£87	12	2	£57	13	10

It may be well to mention here that consistent good grading and marketing has certainly paid. This fruit farm has always been very strict as to weights, grades and marks, and, as a result, this year, when black currant prices were as low as 1*d.* per lb. and many tons in other counties had to be left on the bushes, no black currants from this farm were sold under 4*d.* per lb. The average right through was 5½*d.* per lb., £240 worth being sold from the 5 acres. Actually, over £750 worth of black currants were sold from the whole farm.

Stocks and Strains.—To-day, Type II stocks are being used throughout the new plantations of the farm, being found very satisfactory on the heavy land. The excellent strain of Seabrook's black currants, which the farm possesses, is certainly a great adjunct, and every care is taken in selecting cutting to ensure an improvement, if possible, of this strain.

Acknowledgments.—The writer's thanks are due to Messrs. H. C. Groome & Co. for their courtesy in placing land, machines and even books at his disposal, and for all they have done to help the fruit-growing industry in Cheshire. His acknowledgments are also due to two colleagues, Mr. S. Barratt, B.Sc., for help and guidance in drawing up the financial statement, and Miss Marion Huntbach, for much clerical assistance.

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IMPROVEMENT OF ROUGH AND HILL GRAZINGS

I.—GENERAL REVIEW

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No special knowledge or experience is needed to enable one to realize the immense area of rough and unimproved grass land that occurs on our enclosed farm lands, while a glance at any contour map of the country is sufficient to indicate the high proportion of these islands that comes under the general term "hill grazings."

It is often said amongst informed agriculturists that it is wisest for a particular farmer to pay chief attention to the relatively good land on his holding—to improve still further what is already reasonably good rather than to expend time and money on somewhat improving what is extraordinarily bad. This doctrine has been applied in the past in an almost wholesale manner to grass land. In the light of our latest knowledge about grass land, and of the facilities that now exist for improving the poorest of grazings, this view is certainly no longer legitimately tenable where poor grass lands are concerned, whatever its justification in relation to arable fields.

With so much rough and poor grass land on enclosed farms practically left to its own devices, as a matter of policy, it is little to be wondered at that nothing more than spasmodic endeavours on the part of isolated individuals who are possessed of unusual enterprise have ever been made to improve our open hill grazings.

Broadly speaking, since the War an entirely new factor has to be reckoned with as affecting the grazier's policy towards his rough grass lands—be these fields of awkward approach on enclosed farms or be they open hill grazings. This new factor is, of course, modern motor traction; and if we think in terms of caterpillar as well as of wheeled vehicles and tractors very little of Great Britain to-day is inaccessible to manures and seeds. This is not all, however, for an enormous area that, even a decade ago, nobody would have supposed could yet be subjected to the influence of any sort of implement, is, thanks to the caterpillar tractor, in a sense as vulnerable as the rotation lands of Norfolk.

As it was realized that hill land was no longer inaccessible, and that to "cultivate" open grazings was no longer hopelessly out of the question, it was decided in 1927, in connexion

with the grassland researches of the Welsh Plant Breeding Station, to extend detailed investigations to the open hills. The decision taken was considerably influenced by two further interesting facts. In the first place, the writer, acting on the instructions of Mr. C. Bryner Jones (then Professor of Agriculture at Aberystwyth) before the War, had nearly completed a detailed ecological survey of a large and typical area of hill country behind Aberystwyth, and had consequently had considerable opportunities for gaining impressions and forming opinions as to the possibilities which the hills presented for improvement on economic lines. Secondly, and of course a good many years later, trials with the pedigree strains of grasses bred at Aberystwyth had shown a quite unexpected degree of persistency on the part of a particular pedigree strain of cocksfoot on poor land at elevations but little short of 1,000 ft. above sea level. The implication clearly was that the plant breeder, no less than the engineer, would very soon be coming to the assistance of the hill grazier.

Before discussing the detailed experiments that have been conducted during the past few years on the hills, it may be well to consider briefly a few of the more important points brought out by the pre-war survey and by investigations of a general character undertaken before detailed experiments were conducted. This will assist towards a just appreciation of the position and of the possibilities.

Characteristics of the Hill (Welsh) Grazings.—Attention need only be confined here to the gramineous types of vegetation. In any suggestions that are in the first instance made for improvement, areas under such plants as cotton grass, and that are generally of a decidedly boggy nature, are best left entirely out of consideration.

The gramineous vegetation is of three main types: (*a*) the *Agrostis*-fescue heath and mountain pastures; (*b*) the mat or *Nardus* pastures; and (*c*) the flying bent or *Molinia* pastures. These three pasture types possess serious defects common to all of them. In the first place they are associated with a complete lack of leguminous herbs—or these herbs are normally present in but small quantities. White clover and bird's-foot trefoil may occur in reasonable amount on some of the *Agrostis*-fescue pastures at the lower elevations; they are normally entirely absent from the *Nardus* and *Molinia* pastures. White clover can, however, grow in good amount on many of the habitats proper to all of the above pasture types. On intaken

areas near the old mining centres; on sheep tracks and elsewhere where there is, or has been, interference, white clover is often present in really good amount, and at elevations over 1,200 ft. above sea level.

In varying degree sheep's fescue, bent, *Nardus* and *Molinia* all suffer from the same serious defects. They are grasses that have an inherently short growing season, and that remain in a palatable condition for relatively very short periods. Grasses that grow slowly (*Nardus*, bent and sheep's fescue) are only palatable when the leafage is very young. This is markedly so in respect of *Nardus*, which is one of the most unpalatable of grasses and may be regarded as worthless even on a sheep run. If grazed reasonably hard, bent and, to a slightly less extent, sheep's fescue remain palatable longer and have a longer grazing season than *Nardus* and *Molinia*—and the two former grasses in the order mentioned are the most valuable of ordinarily abundant hill grasses. *Molinia* runs away so rapidly when growth starts in the spring that unless cattle are maintained on a hill it soon becomes practically worthless to sheep. In so far as sustained palatability and sustained growth are concerned in relation to hill pastures sweet vernal grass must be ranked at least as high as bent in the scale of values, and Yorkshire fog very decidedly higher.

It follows from what has been said that the improvement of hill grazings need not postulate very great changes. It postulates, first and foremost, the contribution and maintenance of white clover, of increasing bent and sheep's fescue at the expense of *Molinia* and *Nardus*, and of increasing or introducing Yorkshire fog and sweet vernal grass. If nothing more were attempted and if nothing more were achieved we should have effected improvements of the same relative order of magnitude as when we convert an outrun (lowland) bent pasture into a rye-grass-white-clover pasture.

Altering the Balance of the Sward.—It is not difficult to tip the balance of a *Nardus* or *Molinia* pasture somewhat more in the direction of an *Agrostis*-fescue pasture. Burning on a proper rotation and heavier grazing are alone competent to do a great deal. Many examples of this were noted in connexion with the survey. Harder grazing consequent upon some one time favourable interference is also competent to tip an *Agrostis*-fescue pasture in the direction of *Agrostis* domination rather than of sheep's fescue domination—which in itself constitutes a great improvement. This is well seen in

connexion with areas on the hills that must have been ploughed a great many years ago, when the shepherds made summer camps for themselves. These areas are still recognizable by the "narrow" lands, and numerous critical botanical analyses have shown that the flora of such areas frequently still bears some stamp of that long ago interference. This is chiefly shown in a high bent : fescue ratio, and sometimes by appreciable amounts of white clover and traces of weeds like rib grass.

The extent and rapidity with which some intensification in the grazing, even when accompanied by no other interference, can tip the balance of a natural sward in a particular direction is shown to perfection by the behaviour of control plots (being part of manurial experiments to be discussed in a subsequent article) brought under fairly intensive grazing. In Table I are presented data in the case of a *Molinia* pasture and Fescue-*Agrostis* pasture respectively. The plots had been fenced off and were grazed (monthly) six times during the growing season—the grazing being considerably harder and more complete than would ever normally occur on hill pastures. In the table a comparison is made of the herbage offering to the sheep (average of the six grazings) in the first and second years of the treatment.

TABLE I.—*To show* (1) *the relative abundance* (*as average percentage productivity from six grazings*) *of* Molinia, *sheep's fescue and bent on a* Molinia *pasture in the first and second years respectively of controlled grazing, and* (2) *the relative abundance of sheep's fescue and bent on a heath fescue-bent pasture in the first and second year respectively.*

	Molinia pasture			Fescue-bent pasture	
Year of grazing	*Molinia*	Fescue	Bent	Fescue	Bent
First year ..	40	18	Trace	42	34
Second year ..	29	31	6	40	39

The figures speak for themselves and show that a *Molinia* pasture must be regarded as being in decidedly unstable equilibrium and rapidly responsive to altered conditions. The great increase in sheep's fescue, and what may almost be regarded as the appearance of bent, together with the very marked reduction in *Molinia*, herald substantial improvement. The figures show that a fescue-bent pasture is to be regarded as altogether more stable than a *Molinia* pasture—but even here the suggestion is that but one year of harder grazing has begun to favour bent relative to fescue.

Yield and Chemical Composition.—The yield from typical hill grazings is relatively low, being about one-fourth to one-sixth of that of reasonably good lowland pastures, while in

chemical composition the advantage is unmistakably with the lowlands. Typical and representative figures relative to chemical composition, kindly provided by Professor Fagan, are given in Table II.

TABLE II.—*To compare salient features in the chemical composition of the herbage from four types of hill grazings with that from an average lowland pasture—percentages calculated on dry matter.*

	(1) *Nardus* pasture 70	(2) *Molinia* pasture 90	(3) Fescue-*Agrostis* 50 fescue 40 bent	(4) Fescue-*Agrostis* pasture	Lowland pasture
Silica-free ash ..	2.85	3.34	4.40	3.26	5.82
Phosphoric acid (P_2O_5)	0.366	0.42	0.347	0.44	0.69
Lime (CaO) ..	0.184	0.235	0.442	0.39	0.85
Chlorine (Cl) ..	0.300	0.352	0.474	0.46	0.55
Potash (K_2O) ..	1.66	1.58	2.212	2.10	2.94
Nitrogen (N) ..	2.07	2.78	2.07	2.60	3.11

(1) Containing about 70 per cent. *Nardus*.
(2) „ „ 90 „ *Molinia*.
(3) Fescue-*Agrostis* pasture of open hill.
(4) „ „ „ „ enclosed hill.

The figures in the table are based on the average of a large number of samples, and from the point of view of minerals show that the *Nardus* and *Molinia* pastures are decidedly poor in lime when compared with the Fescue-*Agrostis* pastures. All the hill pastures (Fescue-*Agrostis*, *Molinia* and *Nardus*) are poor in both phosphoric acid and lime when compared with even a second grade lowland pasture. One reason for the poor lime content of the hill grazings is the fact that they are to all intents and purposes devoid of legumes, while the lowland swards usually contain wild white clover in reasonable to good amount. White clover, like other legumes, has a high lime content. Thus, at the farm of the Welsh Plant Breeding Station the average lime content (CaO) of wild white clover (month old) leafage is 2·95 per cent. (in dry matter), while the average for bent grass (leaf blade, which has a higher lime content than stem or sheath) is 0·64 per cent., and for cocksfoot, with a high lime content for a grass, not more than 0·91 per cent. This high lime content of white clover is a matter of particular importance in connexion with the improvement of hill grazings.

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MOLASSED BEET-PULP FOR MILK PRODUCTION*

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DURING the winters of 1930 and 1931 investigations, financed in part by the Beet Sugar Factories Committee of Great Britain, were carried out at the Staffordshire Farm Institute to determine the value of molassed beet-pulp in the feeding of milking cows.

The successful continuance of the sugar-beet industry is necessarily a partnership concern between the farm and the factory. As the farmer looks to the factory to buy his beet, so the factory expects the farmer to be a customer for the factory by-products, treacle and dried beet-pulp. Virtually these two are sold together in the form of molassed beet-pulp, and apparently it is more economical to sell them in blended form than as separate substances. A certain prejudice against molassed pulp existed, and the general idea of the experiments was to see how far this prejudice was based on facts. The other part of the experiment was designed to test the value of molassed pulp as a substitute for mangolds in the maintenance ration, and as a substitute for oats in the production ration.

The basis of substitution was as follows. It was assumed that 8 lb. of molassed beet-pulp soaked in the requisite quantity of water would be equal to 56 lb. of mangolds. In the dry form and as part of the concentrated production ration dried beet-pulp was to be equal to oats, weight for weight. The standard rations laid down were :—

For Maintenance.—56 lb. Mangolds
7 „ Meadow Hay
4 „ Oat Straw (long)

For Production.—A mixture of :—
3 cwt. Extracted Soya Bean Meal
3 „ Maize Gluten Feed
8 „ Crushed Oats

and these were given at the rate of 3½ lb. per gallon of milk yielded.

* This is the third of the articles on investigations into the value of sugar-beet pulp as a feeding stuff, concerning which a note was published on p. 978 of the issue for January, 1932. The other two articles appeared, respectively, on pp. 985 and 993 of that issue and related to the value of this feeding stuff for the fattening of store cattle and for Baby Beef production.

The standard ration was altered simply in two ways :—

(1) By substituting 8 lb. of molassed beet-pulp (soaked in 3½ gal. of water) for the 56 lb. mangolds in the maintenance ration.
(2) By substituting 8 cwt. of molassed beet-pulp for 8 cwt. of oats in the production ration.

In each year of the experiment 15 cows were used, and these were selected so as to make three groups which were fairly equal in point of live weight, lactation, service and milk yield.

These details are shown below :—

Experiment commenced December 15, 1929

Group 1.—5 cows, average 84 days since calving, yielding 2,543¼ lb. of milk in 2 previous weeks. Total live weight 51 cwt. 3 qr. 14 lb.

Group 2.—5 cows, average 80 days since calving, yielding 2,514¾ lb. of milk in 2 previous weeks. Total live weight 53 cwt. 3 qr. 7 lb.

Group 3.—5 cows, average 74 days since calving, yielding 2,558¾ lb. of milk in 2 previous weeks. Total live weight 51 cwt. 3 qr. 7 lb.

Experiment commenced January 4, 1931

Group 1.—5 cows, average 87 days since calving, total live weight 50 cwt.

Group 1.—5 cows, average 109 days since calving, live weight 50 cwt.

Group 3.—5 cows, average 116 days since calving, live weight 51½ cwt.

The trial lasted for thirteen weeks, divided as follows :—

3 weeks—all three groups fed on the standard ration.
1 week —"Change over." Group 1. Standard ration as before.
„ 2. Soaked beet-pulp replacing mangolds.
„ 3. Dry pulp replacing oats.
5 weeks—experimental period proper.
1 week —"Change over"—back to standard ration.
3 weeks—standard ration for all 3 groups.
13 weeks.

The changes of food did not affect the health or appetite of the cows in any way, whether the change was from the standard ration to the beet-pulp ration or in the other direction.

The animals selected for the experiments were all mature cows and weighed between 10 and 11 cwt. The average daily yield at the commencement of the trial was about 3 gall. With ordinary yields such as these it was felt that no objection to the use of ½ cwt. of roots per day could be raised.

The animals had water bowls in front of them and they were turned out each morning for exercise. In each year, the trial was during the months of January, February and March.

The figures relating to milk yield during the first experiment are shown below.

The yields of milk from each group on the standard ration were :—

Group 1.—First 3 weeks, total yield 3,521½ lb.
„ 2. „ 3 „ „ „ 3,440½ lb.
„ 3 „ 3 „ „ „ 3,500½ lb.

Milk yields during 5 weeks' experimental period

Group 1.—*Control Ration.*—Total 4,874½ lb. or 975 lb. per week.
Group 2.—*Soaked Molassed Pulp—replacing Mangolds.*—Total 4,929¾ lb. or 986 lb. per week.
Group 3.—*Dried Molassed Beet Pulp—replacing Crushed Oats.*—Total 4,764 lb. or 953 lb. per week.

Yields during second control period of 3 weeks

Group 1.—2,273 lb. of milk or 758 lb. per week.
Group 2.—2,359¾ „ „ 787 „
Group 3.—2,596¼ „ „ 865 „

In the tenth week of the experiment one cow in Group 1 was found to be suffering from an infectious disease. The animal, which was still giving her full quantity of milk, was slaughtered immediately and her milk yields for the last three weeks were estimated on the assumption that her fall in yield would have been normal.

In this group, also, one cow was sick in the last week of the experiment, and her milk yield fell from 112¼ lb. in the 12th week to 84 lb. in the 13th week.

During the 1931 experiment the milk yield data were as follows :—

Yields in 3 weeks on standard rations

Group 1.—2,873¾ lb.
Group 2.—2,683 lb.
Group 3.—2,956 lb.

Yields in 5 weeks of experimental period

Group 1 (Standard).—4,338¾ lb.
Group 2 (Soaked Beet-Pulp, replacing Mangolds).—4,107¼ lb.
Group 3 (Dried Beet-Pulp, replacing Oats).—4,284½ lb.

Yields in second control period of 3 weeks

Group 1.—2,340½ lb.
Group 2.—2,022 lb.
Group 3.—2,195¾ lb.

The average weekly yields of the cows were :—

	Group 1	*Group* 2	*Group* 3
First preliminary period ..	191·5 lb.	178·9 lb.	197·1 lb.
"Change over" week ..	173·0 „	177·9 „	183·2 „
5 weeks' experimental period	173·5 „	164·3 „	173·0 „
"Change over" week ..	170·6 „	150·2 „	152·0 „
Last 3 weeks..	156·0 „	134·8 „	146·4 „

The increased fall in Group 2 is due entirely to one cow, as also in Group 3.

In the first experiment the differences in milk yields between the highest yielding and lowest yielding groups of cows were 2·4 per cent. during the first control period and 3·4 per cent. during the experimental period proper. In the second experiment these differences were 9·4 per cent. and 5·4 per cent. respectively.

The effect of feeding on the live weight of the animals is shown below.

First experiment (1930)

	Commencement	*After 4 weeks*	*After 9 weeks*	*After 13 weeks**
	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.
Group 1 ..	51 3 14	51 0 0	51 0 0	40 1 0
,, 2 ..	53 3 7	54 3 7	54 2 7	53 1 0
,, 3 ..	51 3 7	52 1 7	53 3 21	52 0 0

*4 cows only.

Second experiment (1931)

	January 4	*February* 25
Group 1	50 cwt.	50½ cwt.
,, 2	50 ,,	52 ,,
,, 3	51½ ,,	52½ ,,

Periodical tests of the milk for quality were made as follows :—

Year 1930

Butter fat (averages)

First control period

Group 1.—3·2 per cent. Fat a.m. and 4·11 per cent. p.m.
,, 2.—3·21 ,, ,, 4·06 ,, ,,
,, 3.—3·21 ,, ,, 3·97 ,, ,,

Experimental period

Group 1.—3·17 per cent. Fat a.m. and 4·19 per cent. p.m.
,, 2.—3·23 ,, ,, 4·14 ,, ,,
,, 3.—3·31 ,, ,, 4·15 ,, ,,

Second control period

Group 1.—3·25 per cent. Fat a.m. and 4·18 per cent. p.m.
,, 2.—3·42 ,, ,, 4·02 ,, ,,
,, 3.—3·18 ,, ,, 4·2 ,, ,,

Year 1931

Experimental period	*Group* 1 per cent.	*Group* 2 per cent.	*Group* 3 per cent.
Butter fat	3·5	3·8	4·0
Solids-not-fat (by gravity) ..	8·9	9·1	9·2
Control periods			
Butter fat	3·5	3·7	4·0
Solids-not-fat (by gravity) ..	9·0	9·1	9·2

No special investigation was made into the question of taint in the milk from cows receiving molassed beet-pulp. All the milk was of Grade "A" standard, and it was cooled and bottled immediately after milking. No taint was ever

observed at the farm and no complaints were received from the purchasers of the milk. Several thousands of bottles of milk from the experiment were sent out, and it has been observed that those members of the general public who buy graded milk do readily notice and complain about any bad taste that may exist in the milk.

One other aspect of the problem may reasonably be noticed. Each acre of sugar-beet represents 1 ton of beet-pulp available for feeding. It will take about $1\frac{1}{3}$ acres of average oats to provide the equivalent food value of 1 ton of beet-pulp. If, therefore, a farmer can see a profit in beet-growing, but a loss in oat-growing, a problem in farm organization arises. Can he profitably grow more beet, feed beet-pulp in place of oats, and substitute or do without the oat straw ?

Conclusions.—The conclusions drawn from the trial of 1930 agree with those of 1931, and are as follows :—

(1) In the production ration 1 cwt. of molassed beet-pulp is equal to 1 cwt. of crushed oats.

(2) In the maintenance ration 8 lb. of molassed beet-pulp soaked with $3\frac{1}{3}$ gal. of water are equal to 56 lb. of chopped mangolds.

(3) Both the experimental rations are equal to the standard ration from the point of view of (*a*) milk yield, (*b*) live weight of the animal.

(4) Changing from one ration to another had no effect on either the butter fat or the solids-not-fat of the milk.

(5) The quantities of molassed beet-pulp used in the trial did not cause any taint in the milk.

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A STUDY OF SIX YEARS' FARMING RESULTS IN DEVON

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Introduction.—That agriculture is passing through a very critical period will be disputed by very few who have given any study to the subject. A more debated point is the degree of depression in the industry, and how far that depression is widespread. Farming conditions to-day are far from satisfactory and compare very unfavourably with those obtaining in days gone by. While prices of farm produce average only slightly more than in pre-war years, one of the farmer's main items of expense, wages, is nowadays about double what it was before the War, while the increase in wages generally is also reflected in another item—general expenses. On the other hand, it is true that the effect of the high wages figure on the profit and loss account has been somewhat mitigated by recent substantial decreases in the prices of purchased feeding stuffs and fertilizers.

Other indications, referred to from time to time in studying the prosperity or otherwise of farming, are the ability or otherwise of farmers to maintain their payments for rent, or even to pay an increased rent rather than give up their holdings; the ease with which landlords can find new tenants when a farm comes into the market; and the increase or decrease in the number of bankruptcies among the farming community.

A criticism of the above phenomena is that they are but indications, and cannot be regarded as conclusive evidence. They attack the problem from only one of many angles. A more comprehensive way of approaching the problem is to take the actual records of receipts and payments on farms in order to prove what the true position is. Even here, however, difficulties abound. Types of farming throughout the country are by no means uniform, and this difference may cause a divergence in the economic problems of the many types followed in the country. Where corn growing for sale is an important enterprise on the farm, the present low prices for corn are a sure indication of the stern problems with which these farmers are faced. Where the system is more diverse, the slump in corn prices is offset if stock prices maintain their previous level; while farmers who buy in feeding stuffs may even rejoice at the present low prices of corn and the sympathetic fall which has occurred in other feeding stuffs.

Thus, the records of one farm can only be taken with a great deal of circumspection and, moreover, since "no two farms are alike," can be taken to refer only to that farm itself. They cannot be assumed to apply to any other farm or type of farming. Only by taking the average of a sufficiently large group of farms is one justified in saying that any given figures represent conditions generally; and how large the group must be depends, amongst other things, on how uniform or different the sample is, and how wide is the area covered. However, while extreme care must be exercised in deducing the absolute position of agriculture from the rather scanty material available, considerable light is thrown on the relative position of the industry over a period of years where carefully kept records of even a limited number of farms can be followed through for the full period. The following study deals with the records of nine Devon farms over the six-year period 1923-24 to 1928-29. The group is composed of the same nine farms in each year.

Nine Farms in Mid-Devon.—The figures are based on accounts that have been prepared for income-tax purposes. In eight instances, the accounts were prepared by accountants, and, in the ninth case, the farmer himself prepared and submitted his figures to the inspector of taxes.

The farms are situated in the same district, Mid-Devon, the nearest towns being Exeter, Crediton and Cullompton. The soil is mostly a red sandstone, light near Exeter, and eminently suited for barley growing, but becoming rather more loamy nearer Crediton and Cullompton. Taken as a whole it is a fertile district. The average rainfall for the 35 years, 1881 to 1915, was 30·5 in. at Exeter, and 35·27 in. at Cullompton. This is comparatively low for Devon.

The average size of the farms was 270 acres—considerably above the average for the county, and also above the average size of farms in Mid-Devon. However, both in size and system of farming, the farms are very typical of the larger farms in that district, having been chosen with special reference to their suitability in these respects. Another feature is the very mixed character of the holdings. Over the average of the six years, no individual branch of the farms contributed as much as 25 per cent. of the total annual production.

Generally, the rotation followed was either a four- or a five-course. On the barley land near Exeter, the usual rotation was roots—barley—seeds—barley. Sometimes two

straw crops (generally oats and barley), instead of one, were grown before the seeds, and sometimes the seeds were followed by two straw crops. Nearer Crediton, where the land begins to be rather heavier, the typical Norfolk four-course rotation was followed. In this part of Devon, the system of alternate husbandry, so typical of most other parts of the county, is almost entirely absent. The seeds are sometimes kept down for two years, but very seldom for longer. During 1928, the land was distributed between tillage, temporary grass, and permanent grass and orchards in the following proportions: tillage 30·7 per cent., temporary grass 10·1 per cent., permanent grass and orchards 59·2 per cent.

In the following tables, the average total production per farm is given in the form of output, while against this is set the expenditure incurred in producing the output.

It is not the purpose of this article to attempt to reach any general conclusions as to the prosperity or otherwise of farming by examining the results on these nine farms for the period. Such a course would only be justified if the results could be taken as applying to farming generally. Owing mainly to the smallness of the sample, it is not considered that general conclusions as to the economic position of farming can be fairly drawn from the data. The main purpose in presenting the figures is to indicate the tendency over the six years in regard to items of production and of expense, and to suggest some of the causes for the fluctuations in the individual items.

Variations in the profit and loss account must be due to variations in output, or in expenses, or in both. In the first year, 1923-24, expenses exceeded output by £9 1*s.* 10*d.*; but in all the other five years there was a margin, after all expenses had been paid, which varied from £36 18*s.* 2*d.*, in 1925-26, to £492 7*s.* 6*d.* in 1924-25. Over the six-year period there was a total variation of £465 17*s.* 2*d.* in output and of £203 2*s.* 8*d.* in expenditure. This suggests that differences in the profit and loss account, year by year, were due more to variations in output than to variations in expenditure.

Any variations in yearly output over a period must be due to one or both of two factors—(1) to differences in the amounts produced, (2) to differences in the price per unit of the produce—or to the relative differences in valuation of stock on hand at the beginning and end of the year.

Average Output per Farm.—The total output showed no definite tendency over the period, its fluctuations being, of

course, governed by the variations in the individual items of which it is composed. It rose considerably in 1924-25 over 1923-24, only to fall back to less than the 1923-24 level in 1925-26. There was a moderate increase in 1926-27, followed by a smaller decrease in 1927-28, and an even smaller rise in 1928-29. The figures indicate that the fluctuations in output were less severe at the end of the period than they were at its commencement.

Live Stock.—A study of the items comprising output indicates that cattle contributed approximately the same amount to the total output over the first three years, 1923-24 to 1925-26, but fell by more than £120 in 1926-27. The reason for the fall was a writing down in valuation of cattle from £1,218 14*s.* 5*d.* at the beginning of the year to £1,067 5*s.* 7*d.* at the end—a fall that was greater than the decrease in output. The decrease in the index number of cattle at this time indicates that the fall was mainly due to falling prices.

There was only a slight rise in the output of cattle in 1927-28, but 1928-29 showed a return to within £10 of the 1924-25 output, and was only about £26 less than the average of the first three years.

The output of sheep and wool fluctuated more violently than that of cattle. In 1924-25, it was about £112 more than in 1923-24, but in 1925-26 it was less than £300, which represents a drop of £246 from the previous year's total. In each of the last two years, 1927-28 and 1928-29, there was an increase in output, the increase being about £90 in each year. Reference to the index numbers for fat and store sheep during the period indicates that the fluctuations in output were influenced to a considerable extent by price variations.

Pig prices (and, incidentally, the profitability of pig farming) proverbially move in cycles. The variation in the output of pigs shows a more regular trend than does that of cattle or sheep. Although the period is not long enough to establish a definite cycle, there are indications that a peak was reached during 1924-25. The output then fell until 1927-28, when the lowest point was reached. The upward trend had started again by 1928-29, which indicates that the period of decrease was one of about three years' duration. Investigations into the prices of porkers over this period show that a peak occurred in January, 1926. Prices then declined until July, 1928, making a period of decline of 30 months.* There

* *Occasional Notes*, Vol. I, No. 10, page 5, Agricultural Economics Research Institute, University of Oxford, April, 1930.

TABLE I.—ANNUAL OUTPUT AND EXPENSES PER FARM, AVERAGE OF NINE DEVON FARMS, 6-YEAR PERIOD, 1923–24 to 1928–29

	1923–24	1924–25	1925–26	1926–27	1927–28	1928–29
Output per farm—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cattle	529 15 3	501 8 0	522 5 6	398 7 6	412 1 11	491 19 10
Sheep and wool	434 0 3	546 5 4	299 12 9	305 18 0	393 18 6	490 9 7
Pigs	120 6 10	154 0 7	146 3 0	118 13 11	83 17 7	109 7 2
Livestock total	1,084 2 4	1,201 13 11	968 1 3	822 19 5	889 18 0	1,091 16 7
Dairy produce and poultry	515 3 10	570 17 2	522 6 1	491 2 3	486 10 2	432 7 11
Livestock and livestock products total	1,599 6 2	1,772 11 1	1,490 7 4	1,314 1 8	1,376 8 2	1,524 4 6
Corn	417 3 10	632 2 2	451 8 8	643 3 8	517 6 8	497 7 11
Hay and straw	40 10 3	55 7 8	68 12 1	57 16 1	63 6 7	108 12 6
Roots and potatoes	9 19 1	22 3 2	23 1 5	59 10 1	49 8 1	10 12 6
Apples	131 9 3	152 17 11	132 0 8	184 19 10	184 14 0	140 2 9
Sundries	29 2 5	29 17 6	33 12 2	48 1 8	29 17 8	6 11 4
TOTAL	2,227 11 0	2,664 19 6	2,199 2 4	2,307 13 0	2,221 1 2	2,287 11 6
Expenses per farm—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Rent	497 13 7	482 3 11	484 8 3	482 6 3	484 7 3	482 17 4
Rates	88 15 0	72 12 7	81 8 10	85 15 5	88 18 10	81 7 5
Wages	564 13 3	604 6 8	651 17 7	652 3 2	652 9 5	633 2 5
Feeding stuffs	501 7 9	459 5 9	407 7 1	344 17 1	400 5 5	334 3 3
Manures	129 7 3	101 13 1	113 0 4	116 3 2	106 16 5	106 11 11
Seeds	63 18 4	84 0 2	79 14 3	76 5 6	56 3 6	56 6 9
Depreciation, horses	38 12 11	35 2 2	9 2 3	3 6 10	22 3 4	15 3 3
Depreciation, implements	95 17 4	92 16 11	80 19 2	76 2 5	70 12 7	77 9 10
General expenses	256 7 5	240 10 9	254 6 5	272 17 1	254 19 11	246 8 0
TOTAL	2,236 12 10	2,172 12 0	2,162 4 2	2,109 16 11	2,136 16 8	2,033 10 2
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Output	2,227 11 0	2,664 19 6	2,199 2 4	2,307 13 0	2,221 1 2	2,287 11 6
Expenses	2,236 12 10	2,172 12 0	2,162 4 2	2,109 16 11	2,136 16 8	2,033 10 2
Profit	—	492 7 6	36 18 2	197 16 1	84 4 6	254 1 4
Loss	9 1 10	—	—	—	—	—

is a considerable amount of similarity between the two sets of data. There was a connexion between the output of pigs and the index numbers of fat and store pigs over the period, although the large variation that occurred in the index numbers of store pigs tends to obscure this.

Livestock Products. Apart from a slight rise in 1924-25, there was a steady decrease in dairy and poultry produce over the six years. Except in one instance, poultry were not kept to any great extent on the farms, and the decrease, therefore, indicates primarily a decrease in dairy products. In so far as index numbers are reliable as measures of price variations in dairy and poultry produce in a specific area, the fall in output appears to have been connected with a fall in price.

Crops.—In dealing with livestock and livestock products, it is probably safe to say that, in most years, variations in output are due much more to monetary than to physical causes. Epidemic disease, or bad luck in the form of deaths among stock, may have a considerable influence on individual farms, but spread over a group of only nine farms, their effect is generally of only secondary importance, unless very widespread. Another physical cause is the weather. A mild winter will result in a higher yield of milk and eggs than can be expected under more severe conditions, while grazing cattle will find much more nutriment in grass that has had plenty of sun on it than in grass grown in a wet, sunless season, when there may be much more grass than usual, but of poorer quality. Even so, however, the effect on the output of these branches of the farm is not particularly great, and any deficiency caused by the weather can often be counterbalanced by increasing the ration of artificial foods.

In coming to the third branch of the farm, however, conditions are very different. The output of crops is often more dependent on the weather than on any other cause, and in studying the differences in output, this factor must be borne in mind. It is not only the weather during the time of preparation for, and the actual growing season of, the crop that must be considered. The output of crops depends not only on yield and the price obtained per unit, but also on the proportion of the total crop that is accounted for in the books (*i.e.*, that portion sold off the farm or valued as stores on hand at the end of the year). Any portion of the various crops fed to stock on the farm during the current year would never appear in the accounts. Causes that might lead to fluctuations in

the amount of crops fed on the farm are (1) a hard or particularly long winter; (2) low prices for corn relative to purchased feeding stuffs, making it more economical to feed corn than to buy cakes; (3) a large proportion of poor-quality grain that would command a very low price, or, being practically unsaleable, would, therefore, be kept as food for stock; similarly, a high proportion of good-quality grain might result in a larger proportion than usual being sold off the farm—this factor would be especially important in a barley district; (4) in relation to some crops, the trade in livestock may have some effect on the acreage of a crop grown. Thus, there is probably a connexion between the high price of store cattle in the spring of 1930, which made many farmers afraid to stock their grass land to its full capacity, and the large acreage of hay in the summer of that year.

The only station in the area studied for which monthly rainfall totals have been published over the whole period, 1923 to 1929, by the Meteorological Office, is Cullompton (see Table II).

TABLE II.—MONTHLY RAINFALL TOTALS, JANUARY, 1923, TO DECEMBER, 1929, AS RECORDED AT CULLOMPTON, DEVON.

Month	1923	1924	1925	1926	1927	1928	1929
	in.	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*
January	2·51	4·91	3·48	6·16	5·50	6·38	1·83
February	8·60	0·70	5·33	2·95	4·38	3·50	1·88
March	1·50	2·07	0·52	0·69	4·69	3·75	0·25
April	2·72	3·72	3·54	2·24	2·12	1·28	1·03
May	1·41	4·18	4·87	1·91	0·60	1·87	2·67
June	0·52	3·61	0·20	3·05	2·76	2·66	2·40
July	1·45	4·75	3·13	1·21	3·27	2·06	1·38
August	2·85	4·23	2·84	3·02	2·67	1·72	3·21
September	2·96	5·61	5·04	1·71	5·15	1·20	0·89
October	5·25	5·33	3·59	2·89	2·31	4·74	5·92
November	3·01	4·48	2·96	8·31	4·03	4·38	10·50
December	3·69	3·73	3·99	0·52	3·51	3·87	8·36
TOTAL	36·47	47·32	39·49	34·66	40·99	37·41	40·32

There was an increase in the output of corn in 1924-25 over 1923-24 (£632 2*s.* 2*d.* compared with £417 3*s.* 10*d.*). In 1925-26 there was a fall to within £35 of the 1923-24 amount. This coincided with a fall in the index number of each kind of corn. There was a considerable increase in 1926-27, when the total was higher than in any of the other five years. There seems to be a connexion between the increased output of corn in 1926-27 and the favourable summer of that year (Table II). In the following year, the weather

was by no means so propitious, while prices of wheat weakened somewhat, with the result that the output decreased by more than £120. A further fall of £20 in output took place in 1928-29, low prices being the main cause of the decrease.

Hay is grown primarily for consumption on the farm, while straw in most districts, including Devon, is a by-product in the production of corn and is chiefly used for litter. Hence, not very much hay and straw come on the market, although most of the farms in this study were in the habit of selling small amounts.

The only year where there was a large variation from the mean was 1928-29, when the effect of the good summer of 1928, following the very bad year of 1927, was seen in increasing the stocks on hand at the end of the year, with a consequent rise in output.

Variations in the output of roots and potatoes are chiefly dependent on the extent to which sugar-beet, which is included under this heading, is grown. In 1926-27 and 1927-28, small acreages of the crop were cultivated on several farms in the county, and the higher output of roots and potatoes indicated in those years (Table I) can be mainly attributed to sugar-beet. Four of the nine farmers grew beet in those years. In 1928-29, however, none of the four grew this crop, the effect being seen in the heavy fall in output of roots and potatoes in that year.

The season, again, is the main item that influences the output of apples and cider. Variations in prices exercise a certain effect. Most of the apples have been sold during the period at £3 10*s*. to £5 per ton. The variations in output have not been of a very serious nature, and generally the effect of a bad year has been offset by a good year following it. Output was low in 1923-24 and 1925-26, while 1924-25, 1926-27 and 1927-28 were the best years in the period.

Sundries include such receipts as prize money, service fees, etc. The greatest amount received under this heading was in 1926-27, when the item amounted to £48 1*s*. 8*d*. In 1928-29 it had fallen to £6 11*s*. 4*d*.

The connexion between output and profit can be seen by comparing the years showing the greatest output with those showing the largest profit. The three years when the greatest output was obtained are those in which the profit was greatest. The relationship is not perfect, but there is a definite correlation.

Average Expenses per Farm: *Rent.**—Rent showed very little variation apart from a fall of about £15 in 1924-25 compared with 1923-24. There was a fairly general reduction in the year, which suggests that landlords were then persuaded to reduce their rent from the war-time level. The small variations in the five later years were due to differences in the amount of tithe or land-tax paid, these items being reckoned as rent in that they are a direct charge upon land.

Rates.—Changes in the amounts paid in rates depended partly on the Agricultural Rates Act, 1923, which was passed for the alleviation of agriculture. The high amounts in 1923-24 were mainly due to the full effect of the Act not being felt in that year by farms that closed their accounts before Lady Day. There was an increase from 1924-25 till 1927-28, but a decrease occurred in 1928-29.

Wages.†—Wages rose by substantial amounts in 1924-25 and in 1925-26, after which they remained practically stationary for two more years, and then decreased by nearly £20 in 1928-29. Probably the main reason for the increase in the earlier years was the setting up of the Agricultural Wages Boards, the minimum rates having come into operation for all classes of male workers by March, 1925.‡

Feeding Stuffs.—Feeding stuffs include, not only the cakes, corn, etc., bought, but also the effects of any inroads made upon the usual supply of home-grown foods during the year, in so far as this is indicated by a diminished valuation at the end of the year compared with the beginning. There was a good deal of variation in the amounts. From 1923-24 to 1926-27, there was a decrease amounting to over £156, followed by an increase in 1927-28, with the 1928-29 amount lower than any previous year. The general fall must be attributed, partly, at any rate, to the fall in prices of cakes and corn.

Manures.—Variations in artificial manures have been comparatively slight. This item shows a downward tendency, which again is probably largely due to the decrease in price of some of the more important fertilizers.

* Where a farm was owned by the occupier, rent was estimated on the Schedule A value of the holding.

† Wages include the value of all labour on the farm, paid and unpaid, except that of the farmer himself.

‡ *Agricultural Statistics*, 1925, Vol. LX., Part III, page 86.

Seeds.—Seeds rose in 1924-25 over the 1923-24 amount, but since then there has been an almost continuous fall.

Depreciation.—The depreciation of horses is arrived at by taking the difference between the purchases of horses, plus valuation at the beginning of the year, and the sales of horses, plus valuation, at the end of the year. In some cases, there was an appreciation, and then the amount was subtracted from the depreciation of the majority of the farms. There was a considerable decrease in the depreciation of horses from 1923-24 to 1926-27, but the amount was greater again in the last two years.

The depreciation of implements is based on the valuation of implements and machinery at the beginning of the years, a percentage being deducted for wear and tear. There was a decrease in depreciation in each year until 1928-29, but the valuation at the beginning of each year was less than that at the beginning of the previous year.

General Expenses.—This term includes all those items of expenditure that are not sufficiently important from the point of view of this investigation to be given a column to themselves. The amount did not vary greatly over the period, and represented an expenditure of rather less than £1 per acre.

There was some relation between expenditure and profits, low expenses and high profits generally occurring together. The big exception to this was the year 1924-25, when profits were greatest, and expenses were higher than in any other year except 1923-24.

Profits and Valuation.—Profits depend on (*a*) the difference between receipts and payments, and (*b*) the difference between the valuations of live and dead stock at the beginning and end of the year. A greater or less margin between receipts and payments has a very real effect on the farmer's pocket. The amount of the valuation, however, is an estimate, and depends on the number and class of livestock, or the amount and quality of dead stock valued, on the one hand; and on the value per unit placed on them, on the other hand. Differences in valuation, due to changes in the quantity or quality of stock valued, will certainly influence the farmer's spending power sooner or later. Changes in the value per unit, however, are in rather a different category. Where prices have risen, an increase in the valuation at the end of the year will indicate an increased profit in the accounts. This, however, will not

TABLE III.—VARIATIONS IN VALUATION OF LIVE AND DEAD STOCK, PER FARM, NINE DEVON FARMS, 1923 to 1929.

	Livestock		*Implements*		*Stores*		*Total*	
	Valuation	Increase or decrease (—)	Valuation	Increase or decrease (—)	Valuation	Increase or decrease (—)	Valuation	Increase or decrease (—)
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1923	2,228 17 11	—	957 14 9	—	604 19 0	—	3,791 11 8	—
1924	2,282 1 3	53 3 4	905 10 1	—52 4 8	447 0 7	—157 18 5	3,634 11 11	—156 19 9
1925	2,376 0 7	93 19 4	868 7 2	—37 2 11	590 5 6	143 4 11	3,834 13 3	200 1 4
1926	2,212 16 11	—163 3 8	831 5 4	—37 1 10	538 12 10	— 51 12 8	3,582 15 1	—251 18 2
1927	1,943 19 0	—268 17 11	821 18 0	— 9 7 4	616 4 11	77 12 1	3,382 1 11	—200 13 2
1928	1,959 8 9	15 9 9	810 16 0	—11 2 0	536 6 1	— 79 18 10	3,306 10 10	— 75 11 1
1929	1,947 16 9	— 11 12 0	767 12 0	—43 4 0	634 12 9	98 6 8	3,350 1 6	43 10 8

entitle the farmer to spend more on himself, because he has not yet got the money to spend. If prices remain high when the crops or stock are sold in the next year or two, he will duly receive the money. If, however, what he values are dairy cows, or breeding ewes, which are kept on the farm until they are worn out, or corn which is to be fed to stock, he will never receive the increased price for them, and his profit in the

TABLE IV.—TABLE INDICATING EFFECT OF DIFFERENCES IN VALUATION ON PROFIT AND LOSS ACCOUNT

	Profit or loss as shown by accounts			*Profit if differences in valuation are excluded*		
	£	*s.*	*d.*	£	*s.*	*d.*
1923–24	— 9	1	10	147	17	11
1924–25	492	7	6	292	6	2
1925–26	36	18	2	288	16	4
1926–27	197	16	1	398	9	3
1927–28	84	4	6	159	15	7
1928–29	254	1	4	210	10	8

year in which the values were written-up becomes fictitious. Again, in a fluctuating market, it is quite possible that where valuations were written-up, prices may have fallen again before the product is sold. Hence, where variations in valuation occur, it is necessary to study how these variations have affected the profit and loss account.

Table III gives the opening valuation for each year 1923 to 1929 under the headings live stock, implements, stores, and total, with the increase or decrease during the year. There was a total fall in valuation over the period of £441 10*s.* 2*d.* per farm. Of this amount, however, £190 2*s.* 9*d.* was caused by implements; livestock and stores fell by £251 7*s.* 5*d.*

It is not true to say that variations in valuation do not affect the profit and loss account of the farmer at all, but it is probable that to the farmer they often make less difference than is indicated in the accounts. If differences in valuation were excluded altogether, the total profit over the six years would become £1,497 15*s.* 11*d.*, *i.e.*, £441 10*s.* 2*d.* more than the actual profit as shown in the accounts, the difference being the fall in valuation. Table IV shows the distribution of the profit over the six years (1) as shown by the accounts, (2) if variations in valuation were excluded. To the farmer, the real position probably lies somewhere between the two sets of figures in each year.

The chief interest in this table is that it shows that differences in valuation have a considerable effect in deciding which was the best year in a period. Results were worst in 1923–24 under each system of reckoning, but, whereas the plain profit

and loss method shows more signs of stability in the later years after the violent fluctuations of the first three years, the column giving profits, after deducting differences in valuations, indicates smaller fluctuations in the earlier than in the latter part of the period.

Summary.—The foregoing analysis indicates the wide variations in the annual amounts that are contributed by farms towards the farmers' living expenses. It is true that there were certain factors at work during this period that rendered it to some extent an abnormal period, but these special factors, which had a world-wide significance, will not wholly explain the fluctuations.

The chief reason for the lack of uniformity in the profits was the variability of the output. While there was, generally speaking, a steady decrease in expenditure over the period, the output showed wide variations from year to year.

The reasons for the variations in output were partly physical and partly monetary. Physical causes are mainly the weather, which especially affects the output of crops, but also include disease, accidents, and "bad luck," which influence the output of both stock and crops. The high output of corn in 1926–27 can be attributed in a large degree to the favourable weather in that year. This is also indicated by the value of stores on hand at the end of the year, which exceeded the value at the beginning by £77 12*s.* 1*d.* All branches of output are affected by monetary conditions, the effect being seen in increased or decreased purchases and sales, one year with another, or in increased or decreased valuation at the end of the year compared with that at the beginning. Receipts, payments, and valuation may frequently be all affected in one year. The low output of live stock from 1925–26 to 1927–28 was due largely to the writing down in values of cattle and sheep that occurred in these years. The valuation of cattle in 1926–27 fell by £151 8*s.* 10*d.* per farm. Sheep fell by £114 14*s.* 3*d.* in 1925–26 and by £111 11*s.* 0*d.* in 1926–27. The low outputs and consequently inadequate profits made at about this time were primarily due to the low values of cattle and sheep.

Expenses were gradually reduced; but for a slight increase in 1927–28, there would have been a continuous fall during the six years. The rise in 1927–28 was connected with an increase in feeding stuffs in that year. The period was chiefly notable, as far as expenses were concerned, for stability in rents after 1923–24, stability in wages after the increase in 1924–25 and

1925–26, a general decrease in feeding stuffs, which can be traced largely to a general decrease in purchased cakes, a tendency to decrease on the part of manures and seeds, and a large degree of stability in general expenses.

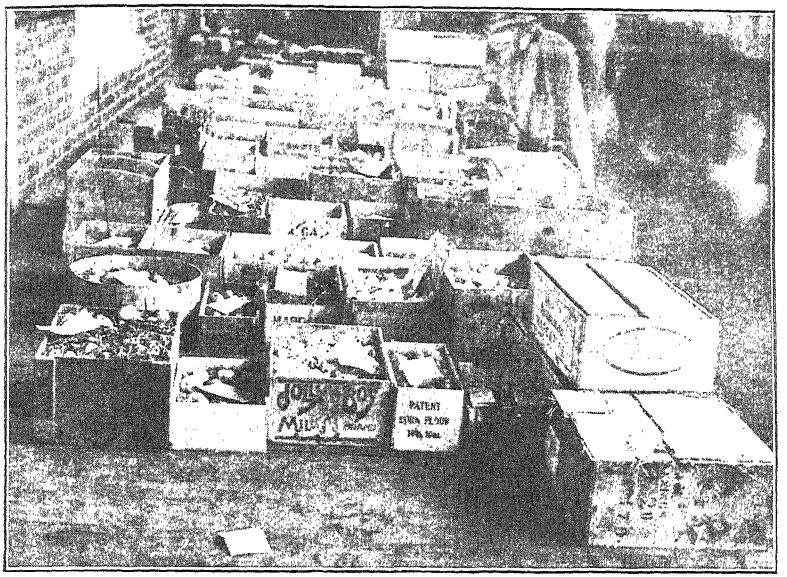
It is hoped that this study will indicate some of the uses of financial accounts in helping to elucidate the causes that have affected the profitability of farming over the period to which it refers. It is true that they are all causes over which the individual farmer has no control, so that while the study may be interesting as an historical record, it can hardly be used by a farmer to improve the management of his own holding. It is but a stage further, however, to compare analysed farm records in such a way that besides showing trends over a period of years, the more important causes for high or low profits on individual farms may also be ascertained.

* * * * * *

A NATIONAL MARK EGG-PACKING STATION

MESSRS. E. J. PARKER & SON, National Mark Egg Packers, Maidstone, furnish an example of an egg-auction business that has been converted into an authorized egg-packing station under the National Mark Scheme. Up to December, 1928, this firm conducted, on the usual lines, a weekly egg auction in Maidstone Market, the eggs being sold in lots, as sent in by producers, at 7½ per cent. commission. Some grading, on standards laid down by the auctioneers, was carried out by producers, but this classification was not uniformly observed and, as is commonly found in country markets, many of the eggs were received in a dirty condition, ungraded and packed in containers of all sorts and sizes (see Fig. 1). After the establishment, in December, 1928, of statutory grades for eggs, under the Agricultural Produce (Grading and Marking) Act of that year, preparatory to the National Mark Scheme, the firm began to bulk the eggs received from producers, grading them to statutory grades and packing them in standard containers before selling by auction.

On the introduction of the National Mark Egg Scheme, in February, 1929, Messrs. E. J. Parker & Son became one of the first of the authorized firms of packers. For a time, the packing business was carried on in a building in the Market, and the auction method of selling continued. Auction selling was soon abandoned, however, and the packing station has since removed to a building in the Southern Railway West



Farmer and Stockbreeder.

Fig. 1.—Showing the packages of all sorts and sizes in which eggs are received at the packing station.

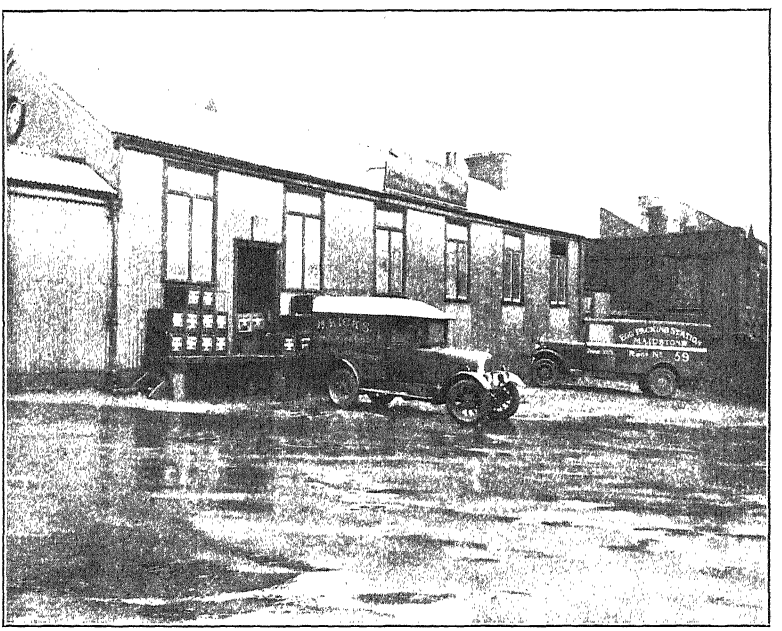


Fig. 2.—Exterior view of the packing station, showing loading and unloading platform.

To face page 1132.

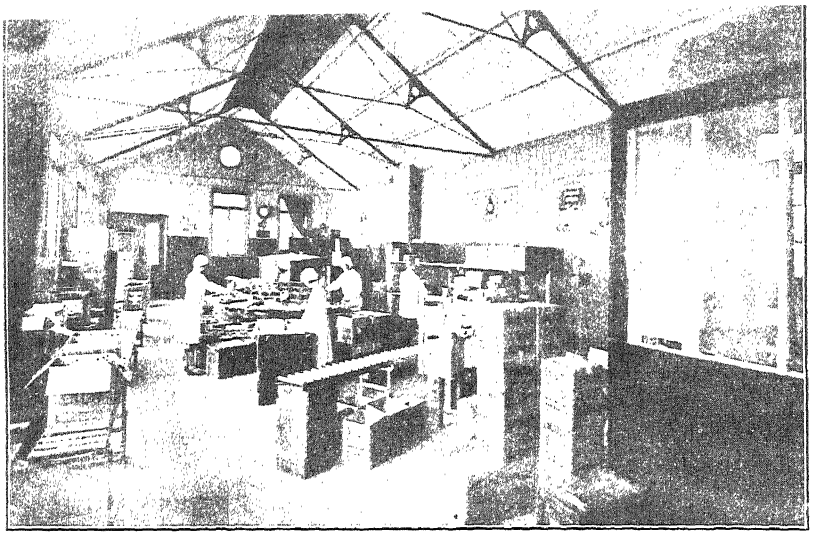


Fig. 3.—General interior view of the packing station, with grading machine in middle distance.

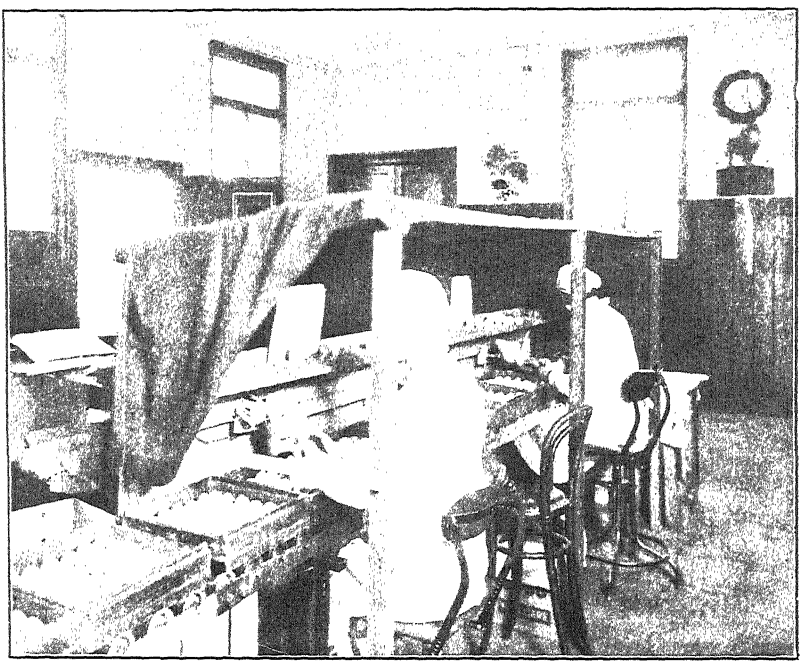


Fig. 4.—The "Candling" Cabinet.

Station Yard. The egg-auction in the market is continued only for those producers who have not yet arranged to have their eggs graded. Naturally, the auction sales are on a much smaller scale than formerly.

The turnover of the station, in 1931, amounted to about 3,370,000 eggs, supplied mainly from about 150 regular sources. Duck eggs, in addition to hen eggs, are packed under the National Mark, there being a good outlet for them in the neighbouring dockyard town of Chatham. Sterilized eggs are sold in season (although not, of course, under the National Mark) on behalf of the Chelmsford Egg Supply Co., Ltd. Arrangements have been made with preserving firms for relieving the station of its surplus in the spring.

Eggs are received from a 30-mile radius, including all mid- and west-Kent, and parts of Sussex and Surrey. About one-third of them is collected by the firm's motor vans, at a charge of 6*d.* per case of any common capacity. Collection is mainly undertaken by local carriers, this service being exceptionally good. Arrangements have been made with many of these carriers to bring in eggs and take back the firm's collecting cases to producers, at an agreed rate to be paid by the sender, and the firm's own van is only used where it has not been found possible to make some such arrangement.

One direction in which the station is experimenting in connexion with the securing of supplies, lies in organizing the collection of eggs by Women's Institutes from their members. These are paid for in bulk by the station, the Institute being left to allocate the returns to its members.

The station prides itself on the high standard of cleanliness of the eggs received. In each of the collecting cases left with producers for filling is inserted a printed notice stating that dirty eggs will be paid for as second quality, and instructing producers to clean such eggs by wiping with a damp cloth. When producers persistently send in dirty eggs, or a large proportion of eggs of poor quality, their supplies cease to be handled. Moreover, as a means of enabling producers to remedy faults, where more than a certain proportion of a consignment must be graded as second quality, the numbers described as "stained," "cracked," "broken yolks," "blood spots" and "watery whites," respectively, are notified to the sender and suggestions made with the object of ensuring improvement.

No contracts are made with producers for supplies, but there is a high degree of loyalty among suppliers. Eggs are

paid for on a grading-out basis. The price paid for each grade is the average ruling for all supplies received on the same day, minus the following deductions: 5 per cent. commission, 1*d.* per dozen for grading and packing, and 6*d.* per case for collecting where this is done by the firm. The commission charge for selling has thus been materially reduced compared with the 7½ per cent. charged for auction selling. As a matter of fact, the 1*d.* per dozen charged for grading and packing does not cover the costs of those services, so that the charge for selling is actually less than 5 per cent. The adoption of a combination of fixed charges and commission has the effect of penalizing producers who only send in supplies during the flush season. The average combined charge over the year amounts to about 10 per cent.: in the spring, however, when egg prices are low, it amounts to as much as 12½ per cent., and in winter it falls to as low as 7½ per cent.

The building used for grading and packing (Figs. 2 and 3) is a large, well-lighted and well-ventilated wooden building. The plant is so arranged that eggs are delivered by a door at one end and pass, in the course of grading and packing, right round the building, so that it is possible to load on to the vans through the same door.

The eggs are collected in wooden 30-dozen and 15-dozen cases, fitted with "Raylite" fittings. On arrival at the station, they are first transferred to wooden trays, each holding 3 dozen eggs; the trays are placed on a runway and gravitate into the candling "cabinet" (Fig. 4)—a partly boarded-off section of the room where the eggs are candled, over "Ovolux" lamps, by three candlers. Second-quality eggs are placed on a shelf provided for the purpose; those of first quality are replaced on the trays and pass along the runway to the grading machine.

The grading machine used is a double-feed "Frost." Both feeds are used in the busy season, only one at other times. It is considered that greater economy and efficiency are attained by candling separately and then feeding direct on to the grader. When candling is done direct on to the grader it is not practicable, even with a double-feed machine, to keep it fully occupied, and the candler, in her anxiety to keep the machine supplied, is, it is suggested, likely to skimp the candling.

In order to avoid waste of labour in carrying trays of eggs from the candlers to the feeders, a curved runway has been specially fitted which conveys trays of eggs right round the

grading machine. The empty trays pass by gravity runways back to the receiving end of the station for refilling. The filled cases of eggs are sealed and labelled and then placed on a gravity runway for conveyance to the loading door.

For packing, this station has, until lately, used only non-returnable, 15-dozen fiberite cases. Recently, however, with the idea of economy, standard wooden returnable 30-dozen and 15-dozen cases have been used for all sales direct to retailers. Non-returnables are still used for transactions with wholesalers. The returnable cases cost 3*s.* 3*d.* each for the 30-dozen type and 2*s.* 9*d.* each for the 15-dozen. Fiberite cases have been obtained at specially cheap rates by buying in bulk in conjunction with another authorized packer at Ashford, but, even so, are regarded as less economical than returnables for direct trade to retailers. The advantages of the non-returnable, so far as convenience in wholesale trade is concerned, are, of course, realized.

A large proportion of the output of this station is disposed of locally to retailers and public institutions, but supplies are also sent to shops in the suburbs of London, and part of the output to National Mark Egg Central, Ltd. As many as two-thirds of the eggs sold are collected by the buyers; the remainder are delivered, at a charge of 3*d.* a case, by the firm's two motor vans. The fact that many of the buyers are located in the surrounding district makes it possible to combine the collection and delivery services to some extent.

This firm prides itself upon the high quality of its output; in 1930 it obtained the bronze medal, and, in 1931, the silver medal, awarded by the British Dairy Farmers' Association for National Mark eggs, at the London Dairy Show.

* * * * * *

INSTRUCTION IN CLEAN MILK PRODUCTION

1.—Clean Milk Competitions.—Particulars relating to the competitions begun during the years ended March 31, 1930, and March 31, 1931, are shown in the detailed statement below. There were 5 more competitions in the second year; nearly 200 more producers took part in the competitions; and more than 55 per cent. of the competitors participated in the scheme for the first time. About 4,300 producers have taken part in at least one competition.

The probationary section of the County Register of Accredited Milk Producers was conducted in Wiltshire in

CLEAN MILK COMPETITIONS, 1929-1931.

County	Commenced 1929-30					Commenced 1930-31						No. of individual producers who have competed at least once
	No. of competitors	No. of cows	No. of samples examined	No. of samples which reached "designated" standards	Total advisory visits	No. of competitors	No. of new competitors	No. of cows	No. of samples examined	No. of samples which reached "designated" standards	Total advisory visits	
Beds	—	—	—	—	—	21	21	500	123	30	30	21
Berks	35	1,324	556	518	50	45	12	1,565	752	703	75	77
Bucks	33	695	414	263	200	54	35	1,041	478‖	313‖	300‖	148
Cambs	29	694	216	160	90	27	11	451	241	137	200	50
Cheshire	36	505	324	278	196	—	—	—	—	—	—	99
Cornwall	—	—	—	—	—	24	18	333	216	195	120	76
Cumberland & Westmorland	—	—	—	—	—	—	—	—	—	—	—	55
Derby	49	1,113	267	128	300	70	20	1,955	397	222	410	170
Devon	—	—	—	—	—	—	—	—	—	—	—	62
Dorset	—	—	—	—	—	—	—	—	—	—	—	53
Durham	26	505	208	179	160	—	—	—	—	—	—	57
Essex	18	588	162	108	36	20	18	525	180	106	53	158
Glos	41	1,162	370	316	200	45	16	1,344	420	282	225	95
Hants	68	2,225	450	108	204	35	15	1,165	235	95	105	197
Hereford	—	—	—	—	—	—	—	—	—	—	—	—
Herts	71	2,077	639	365	160	31	5	880	279	241	65	124
Hunts	24	586	144	62	96	32	15	762	190	73	128	42
Isle of Ely	11	230	68	50	47	11	2	198	63	44	39	15
Isle of Wight	—	—	—	—	—	23	23	384	138	80	107	23
Kent	—	—	—	—	—	34	13	780	307‖	259‖	102‖	134
Lancs	—	—	—	—	—	38	38	1,156	342	305	64	38
Leicester	—	—	—	—	—	—	—	—	—	—	—	79
Lincs, Holland	—	—	—	—	—	—	—	—	—	—	—	—
,, Kesteven	—	—	—	—	—	—	—	—	—	—	—	82
,, Lindsey	15	no record	76	38	76	9	7	112	63	40	40	59
Middlesex	11	412	191	73	70	17	8	616	153	122	100	42
Norfolk	56‡	1,570	392	196	75	44	18	1,440	264	152	176	66
Northants	16	290	95	56	85	20	6	395	120	92	100	60
Northumberland	—	—	—	—	—	20	11	559	181	153	20	72
Notts	—	—	—	—	—	—	—	—	—	—	—	83
Oxon	24	686	228	155	165	27	14	889	258	151	195	80
Rutland	—	—	—	—	—	—	—	—	—	—	—	13
Salop	18	708	88	59	18	51†	38	1,355	305	164	100	77
Somerset	43‡	2,104	303	130	43	14	13	572	126	84	14	256
Staffs	—	—	—	—	—	32*	32	654	363	217	128	20
Suffolk, E. & W.	40	1,327	240	159	150	54	16	1,724	486	361	200	93
Surrey	79	2,300	711	430	316	77	18	2,300	154‖	113‖	154‖	142
Sussex, E.	25	595	214	96	85	21	14	553	189	86	70	219
,, W.	40	1,100	360	279	200	83	52	1,494	747	504	300	125
Warwick	4†	183	28	15	12	13	13	635	117	49	65	128
Wilts	23	493	207	150	115	24	11	539	216	170	126	177
Worcs	39	788	468	396	70	41	30	855	492	342	90	75
Yorks	—	—	—	—	—	—	—	—	—	—	—	163
TOTAL: ENGLAND	874	24,260	7,359	4,667	3,219	1,057	563	27,731	8,595	5,956	3,901	3,805
Anglesey	20‡	222	100	72	135	10	9	63	20	15	60	50
Brecon and Radnor	—	—	—	—	—	—	—	—	—	—	—	35
Cardigan	—§	—	—	—	—	18	18	147	54	34	54	44
Carmarthen	—	—	—	—	—	—	—	—	—	—	—	33
Caernarvon	—	—	—	—	—	25	16	456	192	109	24	55
Denbigh	—	—	—	—	—	—	—	—	—	—	—	80
Flint	12	225	96	47	35	21‡	18	305	116	66	50	72
Glamorgan	—	—	—	—	—	—	—	—	—	—	—	—
Merioneth	18	186	162	116	40	9	9	70	9	—	36	37
Monmouth	—	—	—	—	—	—	—	—	—	—	—	—
Montgomery	—	—	—	—	—	—	—	—	—	—	—	18
Pembroke	30‡	390	164	110	118	9	4	116	81	30	40	76
TOTAL: WALES	80	1,023	522	345	328	92	74	1,157	472	254	264	480
TOTAL: ENGLAND & WALES	954	25,283	7,881	5,012	3,547	1,149	637	28,888	9,067	6,210	4,165	4,285

* Includes Probation Section of Register of Accredited Producers in addition to competition.
† Probation Section of Register of Accredited Milk Producers.
‡ Two competitions were commenced during the year.
§ A competition in cleanliness of goat's milk was held during this year.
‖ Figures incomplete as competitions were still in progress when the return was made.
Clean milk competitions for butter-makers are included in the above tables as follows:—
1929-30: Anglesey, Pembroke; 1930-31: Anglesey, Flint, Cardigan.

1930, and in Suffolk and Salop in 1931, and particulars of these schemes are included in the summary relating to clean milk competitions.

As in previous years, the movement was well supported by the Trade, the number of bonus schemes being 11 both in 1930 and in 1931. Contributions to the general prize funds were also made in many instances.

2.—Advisory Schemes.—Special advisory schemes, to which reference was made in the article which appeared on page 1115 of the February, 1931, issue of this JOURNAL, were continued in those counties where this type of instruction is carried out instead of, or in addition to, the more general type of organized instruction, *e.g.*, clean milk competitions. The following notes on the progress of the various schemes may be of interest.

(*a*) *Wiltshire.*—The advisory service for licensed producers of "designated" milk, commenced in 1929, was continued during 1930 and 1931, 25 producers taking part in the former year. Complete returns for 1931 are not yet available.

(*b*) *Nottinghamshire.*—Three special schemes, confined to the Mansfield, Warsop and Selston, and Hucknall areas, had been held up to the end of 1930, the total number of producers concerned being 88. In 1931, a similar scheme, open to the whole county, was organized and 35 producers took part.

(*c*) *Lincs* (*Kesteven*).—Five producers took part in the advisory service during the year ended March 31, 1931; 17 bacteriological examinations and 20 farm visits were carried out.

(*d*) *Staffordshire and Lincs* (*Lindsey*).—During the year ended March 31, 1931, the numbers of advisory visits carried out were 138 and 20 respectively. In Staffordshire, 6 Grade "A" licences were taken out as a result of the scheme. In Lindsey, 60 milk samples were examined, 57 being tested for butter fat only.

(*e*) *Leicestershire.*—The advisory scheme in this county was continued as in previous years. In addition, arrangements have been made for the examination of samples of the milk supplied to school children, and advisory visits are paid to the farmers responsible for the supply.

(*f*) *Montgomery.*—The advisory scheme was continued as in previous years, but the number of samples submitted by Sanitary Inspectors during the year was small.

3.—County Register of Accredited Milk Producers.—The following summary gives particulars of the schemes in operation during the year ended December 31, 1930. Seven counties introduced or continued the scheme during 1931, but full details of the results are not yet available.

County	No. of producers registered	Total No. samples examined	Remarks
Hampshire ..	34	383	Two producers suspended.
Middlesex ..	5	70	Three producers suspended. Two re-instated.
Suffolk ..	22	278	One producer withdrew; two were suspended and both were re-instated.

County	No. of producers registered	Total No. samples examined	Remarks
Wiltshire ..	29*	338	*Includes four admitted after probationary period.

4.—Milkers' Competitions.—The figures for the years ended March 31, 1930, and March 31, 1931, are shown below :—

	1929-30	1930-31
No. of competitions organized	76	87
No. of competitors	1,507	1,651
No. of competitors who reached proficiency standard	1,243	1,259

5.—Instruction Provided by Other Authorities.—It is interesting to learn that the provision of instruction in clean milk production is a matter which is receiving the attention of many of the local (other than county) councils throughout the country, and the following notes on some of these activities are of interest :—

Bingley Urban District Council (*Yorks*).—For some years past, the Senior Sanitary Inspector has conducted an educational campaign amongst distributors and consumers in the district by means of lectures, advisory visits and the examination of milk samples. Organized courses of lectures have also been arranged at Bingley, the latest of which covers the period October, 1931-February, 1932.

Horsham Urban District Council (*West Sussex*).—A somewhat similar scheme to that mentioned above has been conducted by the Chief Sanitary Inspector for some years past. The periodical examination of milk samples and the assistance rendered in connexion with the modernization of cowsheds are interesting features of this scheme.

Hyde Borough Council (*Cheshire*).—A clean milk competition for producers within the Borough was organized in 1930, with the co-operation of the Cheshire County Council.

Grimsby Rural District Council (*Lincs*).—A clean milk competition was organized in 1931.

Hoyland Urban District Council (*Yorks*).—Organized courses of lectures have been arranged by the Sanitary Inspector, in co-operation with the staff of Leeds University. Samples of all milk retailed in the district are examined periodically.

St. Helens County Borough (*Lancs*).—A clean milk competition was organized in 1931, and it is understood that a further competition will be held in 1932.

Wombwell and Keighley Urban District Councils (*Yorks*).—Clean milk competitions were organized in 1929, in co-operation with Leeds University.

Haworth and Oakworth Urban District Councils (*Yorks*).—Bacteriological examinations of milk and advisory visits have been arranged when supplies have been found to be unsatisfactory.

Aberystwyth Borough Council (*Cardigan*).—A scheme for the improvement of the milk supply has been in force since 1925. During 1931 a scheme involving the regular examination of samples from retailers in the Borough was organized.

Blackburn County Borough (*Lancs*).—A clean milk competition is being held during 1931.

It must be understood that the schemes mentioned above are but a few of those that are now being carried out in all parts of the country. It would be impossible to refer to them all, but those mentioned above will serve as an indication of the scope of the work that is being undertaken.

* * * * * *

MARKETING NOTES

National Mark Eggs.—In December, 1931, the total output of the National Mark Egg Packing Stations was 26·2 million eggs, of which 19·5 million were packed under the National Mark, representing an increase of 57 per cent. compared with December, 1930.

The total output for the year 1931 reached no less than 312 millions, of which 234 millions or 75 per cent. were packed under the Mark, compared with 222 millions and 159 millions respectively in 1930. The increase of 47 per cent. in National Mark output is a satisfactory sign of the growing demand for graded eggs.

The earlier seasonal increase in supplies, to which reference was made in last month's Marketing Notes, and the resultant slump in prices, have led trade buyers to resume the purchase of English eggs; in consequence, prices in the earlier part of January showed a tendency to harden.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during December, 1930, and December, 1931, and the number of sides graded and marked for the five weeks ended January 23, 1931, were as follows :—

		Number of sides
	LONDON	
Weekly average	December, 1930	2,503
,, ,,	,, 1931	2,277
Week ended	,, 26, 1931	2,153
,, ,,	January 2, 1932	1,415
,, ,,	,, 9, 1932	1,870
,, ,,	,, 16, 1932	2,018
,, ,,	,, 23, 1932	1,917
	BIRKENHEAD*	
Weekly average	December, 1930	836
,, ,,	,, 1931	423
Week ended	,, 26, 1931	765
,, ,,	January 2, 1932	208
,, ,,	,, 9, 1932	333
,, ,,	,, 16, 1932	528
,, ,,	,, 23,1932	467
	SCOTLAND*	
Weekly average	December, 1930	2,499
,, ,,	,, 1931	1,421
Week ended	,, 26, 1931	933
,, ,,	January 2, 1932	970
,, ,,	,, 9, 1932	1,391
,, ,,	,, 16, 1932	1,365
,, ,,	,, 23, 1932	1,430

*Sides consigned to London.

TOTAL LONDON SUPPLIES (All sources)		*Number of sides*
Weekly average ..	December, 1930	5,838
,, ,, ..	,, 1931	4,121
Week ended ..	,, 26, 1931 ..	3,851
,, ,, ..	January 2, 1932 ..	2,593
,, ,, ..	,, 9, 1932 ..	3,594
,, ,, ..	,, 16, 1932 ..	3,911
,, ,, ..	,, 23, 1932 ..	3,814
BIRMINGHAM		
Weekly average ..	December, 1930	487
,, ,, ..	,, 1931	914
Week ended ..	,, 26, 1931 ..	829
,, ,, ..	January 2, 1932 ..	698
,, ,, ..	,, 9, 1932 ..	856
,, ,, ..	,, 16, 1932 ..	882
,, ,, ..	,, 23, 1932 ..	874
LEEDS		
Weekly average ..	December, 1931	480
Week ended ..	,, 26, 1931 ..	345
,, ,, ..	January 2, 1932 ..	361
,, ,, ..	,, 9, 1932 ..	479
,, ,, ..	,, 16, 1932 ..	507
,, ,, ..	,, 23, 1932 ..	455
BRADFORD		
Weekly average ..	December, 1931	375
Week ended ..	,, 26, 1931 ..	333
,, ,, ..	January 2, 1932 ..	356
,, ,, ..	,, 9, 1932 ..	434
,, ,, ..	,, 16, 1932 ..	405
,, ,, ..	,, 23, 1932 ..	461
HALIFAX		
Weekly average ..	December, 1931	103
Week ended ..	,, 26, 1931 ..	63
,, ,, ..	January 2, 1932 ..	92
,, ,, ..	,, 9, 1932 ..	105
,, ,, ..	,, 16, 1932 ..	143
,, ,, ..	,, 23, 1932 ..	114

NOTE.—Scottish figures include Scotch sides graded and marked at Smithfield Market, London.

The figures for the London area showed a considerable increase during December, the number of sides graded and marked during the Christmas fortnight reaching 5,268. In 1931, the number of sides graded and marked in the London Area was 98,417 as against 93,688 in 1930.

The weekly average number of sides graded and marked in Birmingham during December (914) again constituted a record. The corresponding figure for December, 1930, was 487. The total number of sides graded and marked in Birmingham rose from 18,293 in 1930 to 30,249 in 1931, an increase of 11,956 sides. This increase of 65 per cent. is the more notable because it largely occurred in the last six months of the year.

The grading figures for the Leeds, Bradford and Halifax area remained steady during December, with a small rise for Christmas week. Grading in this area has not yet completed a full year, but from the commencement on January 26, 1931, to December 31, 51,757 sides were graded and marked.

National Mark Dressed Poultry. — The output of the authorized packing stations during December, 1931, was 19,500 birds, of which 9,500 were packed under National Mark labels. The totals for the period January-December, 1931, were approximately 150,000 and 80,000 respectively.

The first turkeys to be marketed under the National Mark were displayed at Smithfield Market, London, on December 18 last. The turkeys—shown in the illustration facing p. 1144—were consigned by a firm of authorized poultry packers in Gloucestershire, who, since enrolment in the scheme, have found it necessary to move to larger premises.

In common with other classes of National Mark poultry, a disc was attached to each turkey, bearing on one side the grade designation *A1* or *A* and, on the other, the National Mark design. The disc provides the purchaser with a guarantee that he is buying a genuine English bird of a definite standard of quality. In view of the " Buy British " campaign, it would have been advantageous to producers if the bulk of the Christmas supplies of high-grade English turkeys had borne the indication of origin and quality which the National Mark affords. It is to be hoped that, in the next Christmas season, appreciable supplies of National Mark turkeys will be on the markets.

National Mark Canned Fruit and Vegetables : Sales Organization.—An outstanding feature of the trade in National Mark canned fruits and vegetables during 1931 was the attention devoted by both canners and distributors to the important question of sales organization. Efficient sales organization is necessary to secure bulk movement, an even flow of the commodity, and low costs of distribution generally. Reduction of overhead charges in this and other directions means actual savings that may enable the factories to pay higher prices to growers.

The principal wholesale distributive houses have shown increased interest in National Mark canned fruit and vegetables, and this has in some instances led to financial participation in the canneries. Twelve wholesale distributors are now offering National Mark canned fruit and vegetables under their own brand labels. An interesting development, which mainly concerns the larger canners, has been the sale of large bulks to multiple-shop firms. In some cases, the sale price is based on delivery by the canneries to any retail branch and this has necessitated the establishment of area depots by the canneries in order to minimize transport charges.

The canneries of the Co-operative Wholesale Society distribute their output solely to retail co-operative societies throughout the country. The output of thirteen factories is mainly distributed through

travellers direct to retailers; in practically every case, these canners are also interested in the manufacture of other products.

Consideration is being given by some of the smaller canneries to the possibilities of joint-selling through a mutually organized distributive unit with headquarters in London.

The system of distribution, as a whole, appears to offer a ready outlet for the products of each factory and to ensure an even flow of National Mark canned fruit and vegetables to the public.

National Mark Tomatoes and Cucumbers: A Review of Progress in 1931.—The National Mark scheme for tomatoes and cucumbers has now completed its third season, and a large proportion of the growers who were originally authorized have such faith in the scheme as to regard the application of the National Mark to their packages as a matter of course. The low prices ruling during the season, however, in conjunction with the poor quality of the crops—due to unfavourable weather conditions—led some growers to abandon temporarily the use of the Mark.

Growers in places remote from the centralized production areas who market in nearby consuming centres have realized prices that, while not being very high, have at least shown a profit, and appear to have found the National Mark scheme a decided advantage.

One large grower of tomatoes who has hitherto held aloof from the scheme commenced using the Mark on a portion of his 1931 crop, whilst another authorized packer has used the Mark on cucumbers very extensively. Such examples have considerable influence on the rank and file of growers in, for instance, the Lea Valley, and if the trading position should improve in the near future the scheme is likely to extend. The numbers of packers registered for tomatoes and cucumbers have increased by 15 and 2 respectively.

Grading.—On the whole the grading of National Mark supplies has been found on inspections to be very satisfactory. Five contraventions only have been reported and these were mainly due to inefficiency on the part of the packing staff or to temporary lack of supervision by the grower. Improvement in the grading of tomatoes marketed by growers who do not use the Mark has been maintained. There has also been a general improvement in the grading of cucumbers, for which propaganda under the National Mark scheme has been largely responsible.

Packages.—The only amendment to the scheme for the 1931 season concerned the optional use of black or of green paper in place of pink and/or white used for lining the packages, but no packers appear to have availed themselves of the privilege.

Labels.—In order to meet criticisms, a reduction in the prices charged for National Mark labels has been made, and some modification of design is under consideration.

Quantity Marketed.—Although no precise figures are available, the steady increase in the sales of National Mark labels indicates that larger quantities of tomatoes and cucumbers were packed under the Mark in 1931 than in 1930.

Distribution.—Tomatoes packed under the Mark were more widely distributed than in previous years. The Lea Valley growers using the National Mark consigned largely to the midland and northern markets, only a relatively small proportion coming to London.

National Mark Cider.—The following additional applicants have been authorized under the scheme :—

R. R. Paul, Crosslands, Shillingford, Exeter.
The National Fruit and Cider Institute, University of Bristol, Long Ashton, near Bristol.
A. J. Gill, Greenend, Plymtree, Cullompton, Devon.

The total number of authorized packers is now seventy-four, consisting of forty-four manufacturers and farm cider-makers, two associations of farm cider-makers and twenty-four bottlers.

Authorized packers of National Mark cider met with success in the Cider and Perry Competition at the Brewers' Exhibition held during the first week of November, 1931. Both the championship award and the reserve were secured by National Mark packers, who also took the first place in seven out of the eight open classes. In addition, eleven other awards in the competition fell to authorized packers.

National Mark Wheat Flour.—The satisfactory results of the bread-making tests carried out at the National Bakery School with samples of National Mark *All-English* (*Yeoman*) flour from the 1931 crop were briefly referred to in the January issue of this JOURNAL. The tests furnished additional evidence of the suitability of *Yeoman* for commercial bread making, and of uniformity in the quality of flours packed under the National Mark Scheme. The following are the conclusions drawn by the Director :—

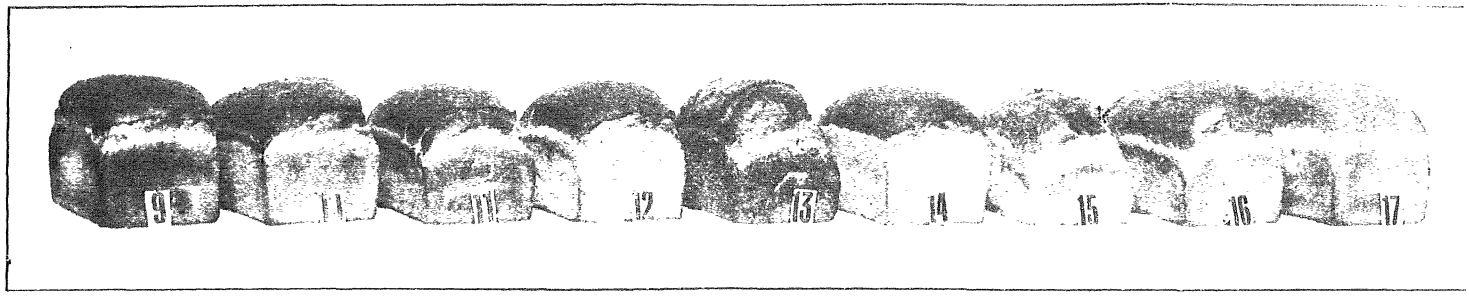
(1) All the flours had a high maltose figure, but the fermentation tolerance was not affected. The flours were more uniform than those of last year as regards colour, water absorption and loaf volume.
(2) All the doughs gassed well, but were a little on the "green" side on the three-hour process used. A longer process is therefore desirable. With two exceptions, water absorption was lower than last year. Fifteen gallons per sack were used for the test, but it would be inadvisable to use more than 14½ gallons in general practice.
(3) All the bread had a golden crust, much superior to that of previous years, with a better and more uniform bloom and more "lift" in the oven. The very rough break which has characterized English bread was almost entirely absent.
(4) In every respect, the quality of the *Yeoman* flour is such as to produce good commercial bread. It is also admirably suited for blending with stronger flours to improve the bloom and produce flavour in the crumb.

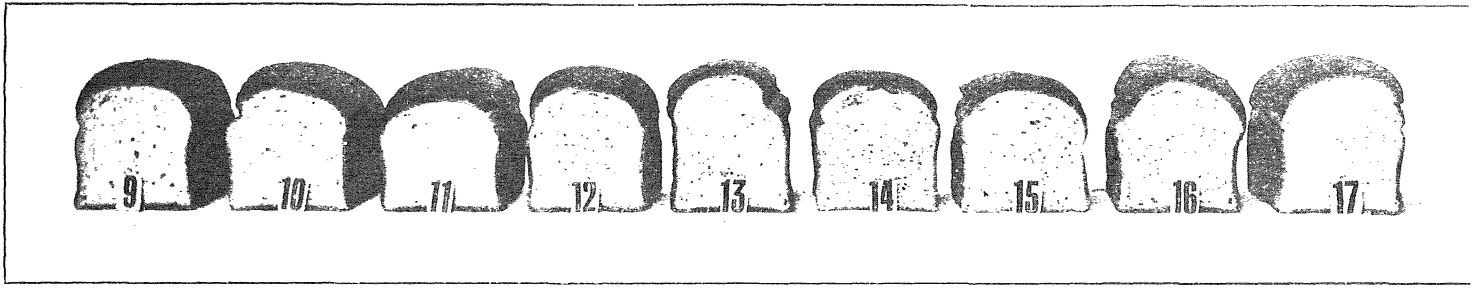
The recommendation made last year that a small quantity of lard or vegetable oil should be used in the dough to promote easy working does not apply to the flours from the 1931 crop.



Lord and Lady De La Warr inspecting the first consignment of National Mark turkeys at the Central Market, Smithfield, London, December 18, 1931.

To face page 1144.





Bread-making tests with National Mark All-English (Yeoman) flour of the 1931 crop at the National Bakery School. (See note opposite and tables pp. 1146 and 1147.)

The following table (pp. 1146 and 1147) shows the observations made in regard to the samples tasted. Illustrations of the test loaves face this page. [The flour from which the loaf marked 12 in the photograph was baked was found on analysis not to conform to the definition of quality for National Mark *All-English* (*Yeoman*) and the observations made in the case of this flour are not therefore reproduced in the table.]

National Mark Malt Products.—It has been found desirable to specify more clearly the laboratory method to be used in determining the diastatic activity (or Lintner value) of malt extract and malt flour for the purposes of the National Mark Malt Products Scheme. New Regulations embodying the revised method have, therefore, been made under the Agricultural Products (Grading and Marking) Acts, 1928 and 1931, and the Regulations made in 1929 have been revoked. A new edition of the leaflet explaining the scheme (Marketing Leaflet No. 14) has also been prepared.

Marketing Demonstrations.—By co-operation between the Ministry and the Kent Education Committee, a students' course for women, in apple grading and packing, was held at the Kent Farm Institute, Borden, Sittingbourne, from December 29 to January 8. The course was attended by seventeen students. On January 6 and 7, the students gave a public demonstration of grading and packing, and the Ministry's fruit marketing demonstration was staged in an adjoining room. Several firms also exhibited grading machinery.

The holding of this course was in the nature of an experiment, and so successful did it prove that, in response to several requests, arrangements were made for a similar course for men during the period January 18-23.

At the National Dairy and Ice Cream Convention held at Olympia, January 18-21, the Ministry, in conjunction with Specialist Egg Farms, Ltd., Barnet, arranged a working demonstration of the grading and packing of eggs under the National Mark scheme.

Publicity for National Mark Produce.—The Ministry's programme of Press advertising was continued during January, National Mark beef being advertised in the Birmingham, Leeds and Bradford newspapers and in the *Meat Trades Journal*, and National Mark canned vegetables in trade papers. The special series of advertisements of National Mark products in selected women's journals was also continued.

REPORT ON THE ANALYSIS AND BAKING QUALITIES OF ALL-ENGLISH YEOMAN WHEAT FLOUR FROM 1931 CROP (*see note on p.* 1144).

ANALYSIS REPORT				BAKING REPORT		
Place of origin	Number of sample on photographs	Ash content of flour. Per cent.	Moisture content of flour. Per cent.	General baking qualities (3-hour process)	Characteristics of finished loaves	General comments
Herts	9	0·44	14·3	Fairly good sample, gave a moderately good dough with 15 gal. per sack; fermented well; gassed freely.	A regularly sprung loaf, good bloom.	A good flour, behaving well during fermentation.
Cambridge ..	10	0·49	14·1	Rather a soft dough and rather "sluggish" in fermentation, with 15 gal. per sack.	A larger loaf than was anticipated—rather flat, but regular and with good crumb.	A flour with lower water absorption than usual, but by no means soft.
Norfolk ..	11	0·42	14·3	Soft dough, not quite so soft as (10) although the difference was slight; gassed well.	Medium volume with good bloom and excellent, even texture and flavour.	Low water absorption capable of taking only 14 gal. per sack.

Northampton..	13	0·48	15·5	A good sample. Fermented well, softened during fermentation.	A good bold loaf, with a nice bloom and general appearance.	A very good sample of flour.
Devon.. ..	14	0·48	15·1	Dough softened considerably during fermentation.	A good loaf; not quite so bold as (13).	A flour, susceptible to variations in dough temperature. Up to the average.
Kent	15	0·48	14·1	Gave a good dough —fermented well, softened during fermentation.	A good bold-looking loaf, nice creamy crumb colour.	A moderately good sample of Yeoman.
Kent .. .. (treated with K.J. Thermo process)	16	0·48	13·6	This dough was the firmest and softened least during fermentation.	A very good loaf with larger volume than (15). Bloom good. Colour of crumb better than (15).	A very good flour, easy to handle.
Leicester ..	17	0·46	16·7	A tough dough—at first rather solid and possessed little resiliency, but softened during fermentation; gassed freely.	A bold-looking loaf, rather flat on top. Good crumb.	A very good sample of flour which gave a dough with normal water absorption. Handled well, producing a bold loaf of good colour.

Under the twelve months' contract for the use of a number of omnibus sides in London—reference to which was made in the May, 1931, issue of this JOURNAL—side streamers advertising National Mark beef, eggs, canned fruits and canned peas are being displayed for the remaining period of the contract, which expires at the end of March.

The British Commercial Gas Association has sent a circular letter to its members (numbering about 1,000) advocating the use of National Mark and other home produce in cookery demonstrations and at gas exhibitions. The Association suggests that the fact of such use should be made known to those attending demonstrations, and that opportunities should be taken to distribute the Ministry's leaflets.

Experience has shown the value of lectures to women's organizations as a means of disseminating knowledge regarding the National Mark scheme. 315 such lectures by trained women speakers were delivered in 1931. Of these, 127 and 60, respectively, were given in the Birmingham and Leeds areas with special reference to National Mark beef, and the remaining 128 to Women's Institutes and similar bodies in all parts of the country. In addition, the Ministry has received many requests from Grocers' Associations for addresses on the subject of the National Mark. Addresses have already been given this winter to Associations at Hull, Harrogate, Accrington, Stafford, Birmingham, Peterborough, Ipswich, Kettering, Newport (Mon.), West Ham, St. Pancras and Brighton; pending engagements include addresses at Bradford, Burnley and Leicester.

From time to time these notes have referred to the many ways in which authorized packers and others have augmented the Ministry's advertising and other propaganda in favour of National Mark products, and the action taken by the Melton Mowbray and District Farmers' Association to stimulate local interest in the National Mark Egg Scheme should commend itself to other authorized packers of National Mark products as a convenient means of advertising both their own output and the National Mark movement as a whole. This Association invited the teachers and senior children from Leicestershire schools to pay a visit of inspection to their egg-packing station, and offered prizes of cartons of eggs for the best essays on the visit. About 100 children accepted the invitation and the essays showed the value of the visit as a means of imparting the principles of the National Mark Egg Scheme. The visit was referred to in the local press, which also reproduced the essays that were awarded first and second prizes. As a sequel, the Association has agreed to receive a party of teachers on a similar tour of inspection.

Cooking Quality of Ware Potatoes.—Arising out of the investigations conducted at the Department of Household and Social Science, King's College, University of London, into the discoloration of potatoes as a result of cooking, it is believed that a simple test has been discovered by means of which it should be possible to tell by examination of a sample raw potato whether or not a similar potato would blacken on cooking.

It was found that all potatoes examined contained substances in greatly varying amounts which, on treatment with nitrous acid followed by an alkali, give a fine red colour. The amount of the red substance produced in this test was found to vary exactly with the amount of blackening that takes place on cooking. The test is carried out as follows. A transverse section of potato about 5 mm. thick is peeled thinly and covered with 7 per cent. sodium nitrite solution

(about 25 c.c.) in a small porcelain basin. About 2 c.c. of dilute hydrochloric acid (1 volume of concentrated hydrochloric acid to 2 volumes of water) are added and the mixture left for five minutes. The liquid is then poured off and the section of potato covered with 16 per cent. sodium hydroxide solution (about 25 c.c.). The red colour develops in about five minutes, at first chiefly on the outer and inner edges of the fibro-vascular layer of the potato, then through the whole of this layer, but it often extends towards the centre.

It appears that the production of the red colour is in some way connected with the blackening which takes place with cooking, and it is hoped that the test will be found to be useful and practicable under commercial conditions.

Sugar-Beet : Sugar Production, 1931-2.—According to the returns made by the beet sugar factories operating in Great Britain, the total quantities of beet sugar manufactured during December, 1931, and the corresponding month in 1930 were :—

December, 1931 .. 1,394,111 cwt.
December, 1930 .. 2,261,698 ,,

The total quantities of sugar produced during the two manufacturing seasons to the end of December were :—

1931-2 .. 4,924,598 cwt.
1930-1 .. 6,990,580 ,,

The following weekly averages have been compiled from data supplied to the Ministry in respect of beets delivered to the beet sugar factories in England and Wales during the period December 19,1931, to the end of the campaign. Averages for the corresponding weeks of the previous season, together with the final averages for that season, are shown for comparison :—

Week ended	Average weight of roots (grammes)		Average sugar content (per cent.)		Average weight of sugar per root (grammes)	
	1931-32	1930-31	1931-32	1930-31	1931-32	1930-31
1931						
December 19 ..	376	494	16.6	16.3	62	81
,, 26 ..	362	512	16.5	16.1	60	82
1932						
January 2 ..	352	512	16.5	15.9	58	81
,, 9 ..	345	518	16.0	15.7	55	81
Average for Season ..	392	508	17.3	16.7	68	85

Below are given the average prices of raw cane sugar certified by the Minister for the periods specified, and the rates of advances under the British Sugar Industry (Assistance) Act, 1931, per cwt. of beet sugar of a polarization exceeding 98 degrees :—

CERTIFIED AVERAGE PRICE PER CWT. OF RAW CANE SUGAR.		RATE OF ADVANCES PER CWT. OF EX 98° BEET SUGAR.	
Fortnight ended :—	*s. d.*	Week of manufacture ended :—	*s. d.*
December 26	6 8¼	January 2	1 1
January 2	6 10½	,, 9	0 11
,, 9	6 11¾	,, 16	0 10
,, 16	6 11¾	,, 23	0 10

Cheese Standardization in Bavaria and Würtemberg.*—In October and November, 1931, the Bavarian and Würtemberg regulations with regard to the marking of cheese were developed into a regular system of standardization. From now on, cheese (*i.e.* rennet-cheese) may not be marketed or offered for sale in Bavaria and Würtemberg except under definite quality designations based on fat-content in the moisture-free substance.

The efforts of South Germany to regulate the trade in milk products —which among other things have led to regulations for Mark butter— have thus been notably advanced by the two local governments concerned, whose regulations agree verbally except for a few details. The chief difference is that Würtemberg establishes an inspection service covering the whole marketing process, including the retail stage, while Bavaria reserves the right to delegate executive power to local authorities. According to expert opinion, the Würtemberg regulations must be regarded as the better.

Both sets of regulations cover all cheese produced for market, stored ready for sale, or actually being dealt in within the respective frontiers. The following minimum fat-contents in the moisture-free substance are prescribed :—

(1) for hard cheese of the Swiss type, 45 per cent. ; for pasteurized or processed cheese, 43 per cent. ;
(2) for all other cheese, 20 per cent.

Bavaria expressly prohibits any marginal variation below this limit.

The following quality grades have been formulated on the basis of the fat-content in the moisture-free substance :—

(1) "*Double Cream Cheese*" : minimum fat-content, 60 per cent. If cheese has a 70 per cent. fat-content, this can be indicated on the wrapping.
(2) "*Cream Cheese*" : minimum fat-content, 50 per cent.
(3) "*Full Fat Cheese*" : minimum fat-content, 45 per cent. Hard cheeses of the Swiss type, in particular, belong to this class.
(4) "*Fat Cheese*" : minimum fat-content, 40 per cent.
(5) "*Three-quarter Fat Cheese*" : minimum fat-content, 30 per cent.
(6) "*Half-Fat Cheese*" : minimum fat-content, 20 per cent.

With hard cheeses and half-fat "cut cheeses" (Schnittkäsen), the fat-content must be marked on the cheese itself, and with all other cheeses, on the packing.

On all cheese produced and stored in Würtemberg or Bavaria there must be marked not only the quality designation (see above) but also either "Württ" or "Bavaria," with the fat-content and the official control number of the producing concern. It is interesting that Bavaria not only exempts pasteurized or processed cheese from the obligation to be marked according to its origin as Bavarian or Allgäuer, but expressly forbids that it should be so marked.

When exposed for sale in shops, cheese of whatever origin must bear a description, including the quality designation ; price-lists in hotels and public-houses must also quote the quality designation.

* * * * * *

**Blätter für landwirtschaftliche Marktforschung*, Nov., 1931. (Journal of the Institute for Research in Agricultural Marketing, Berlin.)

SUGAR-BEET INDUSTRY IN GREAT BRITAIN

POSITION OF THE FACTORY COMPANIES ON MARCH 31, 1931

THE "Orange Book" on the *Sugar-Beet Industry at Home and Abroad*,* recently published by H.M. Stationery Office, provides an exhaustive survey of the working results of beet sugar factories in this country up to the end of the 1929-30 campaign, and data relating to production during the 1930-31 campaign. The following review of the position of the factory companies on March 31, 1931, and of the trading results of the 1930-31 manufacturing campaign has been prepared by the Markets Division of the Ministry, and is published, with the companies' consent, in order to bring up to date the information given in the above-mentioned report.

The following statement gives a summary of the combined balance sheets of the beet sugar factory companies in Great Britain—15 companies, representing 18 factories—as at March 31, 1931, and shows the financial position of the companies as a whole at that date. The statement also shows the increase or decrease in the various items as compared with the figures at March 31, 1930. (See Table 67 of the Sugar-Beet Report.*)

Reserves and unappropriated balances carried forward amounted to £1,695,452, equivalent to over 23 per cent. of the total share and loan capital.

Dividends paid in 1930-31 totalled £411,562 and averaged 8·8 per cent. on the share capital, as against £481,408 and 10·3 per cent. in 1929-30.

Expenditure on plant, machinery and equipment during the year ended March 31, 1931, amounted to £295,536, making the total capital expenditure to date on the erection and equipment of all the British beet sugar factories, £8,703,085. Of this amount, a sum of £2,789,772, or 32 per cent., has been written off, the depreciated value on March 31 last being £5,913,313.† The capital cost per ton of beets worked in the factories for the manufacture of sugar during the 1930-31 season was £2·8, against £4·2 in the 1929-30 season. (See Table 64 of the Sugar-Beet Report.)

* Economic Series No. 27, His Majesty's Stationery Office, 1931, price 6*d*. net, post free 1*s*.

† The difference between this figure and that shown in the summary of the balance sheets is accounted for by certain capital assets, the cost of which is not classed as factory expenditure.

SUMMARY OF BALANCE SHEETS OF BRITISH BEET SUGAR FACTORY COMPANIES AS AT MARCH 31, 1930 AND 1931.

	As at March 31		Increase or Decrease
	1930	1931	
Liabilities—	£	£	£
Share Capital	4,658,140	4,678,640	+ 20,500
Mortgages and Debentures	2,032,665	1,846,087	— 186,578
Bank and other Loans ..	602,957	718,741	+ 115,784
Sundry Creditors and Outstandings	1,039,829	924,853	— 114,976
Reserves*	1,284,046	1,350,401	+ 66,355
Profit and Loss Balances before appropriation of Dividends, *less* deficits	682,593	756,613	+ 74,020
Total Liabilities ..	10,300,230	10,275,335	— 24,895
Assets—			
Beet Sugar Factories and equipment, *less* Depreciation	6,092,662	5,927,086	— 165,576
Investments	839,121	836,722	— 2,399
Stocks and Stores ..	1,654,628	1,684,368	+ 29,740
Sundry Debtors and Prepayments	561,477	896,220	+ 334,743
Cash Balances	1,095,550†	888,626†	— 206,924
Preliminary Expenses ..	56,792	42,313	— 14,479
Total Assets ..	10,300,230	10,275,335	— 24,895

* Including Capital Reserves; also Special Reserves amounting to £20,000 in 1930 and £20,276 in 1931.

† Including Dividend of Private Company paid on account prior to date of Balance Sheet.

The maintenance of an adequate supply of beets to enable the factories to work to full capacity for as long a period as possible is an important factor in ensuring the financial stability of the industry. During the manufacturing season 1929-30, the factories worked on an average for a period of 91 days, and the average daily tonnage of beets worked was 21,809 tons. In the 1930-31 season, the average working period extended to 111 days, and the average daily throughout was 27,572 tons—a figure considerably above the normal working capacity of the factories. (See Table 64 of the Sugar-Beet Report.)

The following Table, compiled from confidential data supplied by all the factories, shows the total manufacturing costs and charges, and the costs per ton of beet worked, for the 1930-31 season compared with the 1929-30 season.

MANUFACTURING COSTS AND OVERHEAD CHARGES OF BRITISH BEET SUGAR FACTORIES FOR THE YEARS 1929-30 AND 1930-31—TOTAL AND PER TON OF BEET WORKED.

Item	1929-30		1930-31		Increase or Decrease
	Total	per ton of beet	Total	per ton of beet	per ton of beet
	£	s. d.	£	s. d.	s. d.
Coal and Coke	307,240	3 1	449,640	2 11	— 0 2
Limestone ..	64,561	0 8	94,856	0 7	— 0 1
Bags	189,922	1 11	217,620	1 5	— 0 6
Other Manufacturing Supplies	122,503	1 2	152,224	1 0	— 0 2
Repairs and Maintenance	166,957	1 8	217,143	1 5	— 0 3
Salaries and Wages ..	673,272	6 10	802,775	5 3	— 1 7
Rates and Insurance ..	71,958	0 9	56,259	0 4	— 0 5
Other General Charges ..	120,519	1 3	97,182	0 8	— 0 7
Beet Expenses	176,876	1 9	303,247	2 0	+ 0 3
Totals ..	1,893,808	19 1	2,390,946	15 7	— 3 6

The above Table shows that the total cost of manufacture per ton of beet in the 1930-31 season was 15*s.* 7*d.*, or 3*s.* 6*d.* per ton less than in 1929-30. Although economies in production were effected during the year as a result of further progress in technical efficiency at the factories, the decrease is mainly attributable to reductions in the unit costs of labour and overhead charges resulting from the exceptionally heavy throughput of beet. As may be seen from comparison with the figures given in Table 70 of the Sugar-Beet Report, which gives the unit costs of manufacture for each of the subsidy years, the total cost per ton of beet in 1930-31 was less than half that in the years 1924-5, 1925-6 and 1926-7.

The economies effected in expenditure in the factories were offset by the loss in revenue due to the low prices obtained for the sugar and by-products manufactured. The following Table, which is a summary of the Trading and Profit and Loss Accounts of all the factories for the 1930-31 season, shows the total income from products, total profits, and the manner in which the profits have been allocated. The various items are also shown expressed in terms of per ton of beet. Corresponding figures for previous years are given in Appendices F and G and Table 91 of the Sugar-Beet Report.

BRITISH BEET SUGAR FACTORY INCOME, EXPENDITURE AND PROFITS FOR THE YEAR ENDED MARCH 31, 1931.—TOTALS OF ALL FACTORIES AND AVERAGES PER TON OF BEET WORKED.*

	Total	Per ton of beet
Income, Expenditure and Profits—	£	*s. d.*
Net Income from Sugar (less Excise Duty)	4,532,535	29 8
Molasses	135,960	0 11
Pulp	574,532	3 9
Lime Sludge	2,369	—
Total Income from Saleable Products	5,245,396	34 4
Add Subsidy	6,138,965	40 1
Total Income	11,384,361	74 5
Less Cost of Beets	7,625,741	49 10 (67%)
Balance to Factory	3,758,620	24 7 (33%)
Less Manufacturing Costs and Overhead Charges	2,390,946	15 7
Trading Profit	1,367,674	9 0
Profit on Subsidiary Industries	132,915	0 10
TOTAL PROFIT	1,500,589	9 10
Appropriations of Profit—		
Interest Charges†	95,820	0 8
Directors' Fees	30,685	0 2
Preliminary Expenses, etc., written off	15,252	0 1
Depreciation	461,119	3 0
Income Tax	274,915	1 10
Dividends	411,562	2 8
Reserved and Unappropriated Balances	211,236	1 5
Trading profit as above—Total	1,500,589	9 10

* The figures are based on the confidential Trading and Profit and Loss Accounts of all the Companies.

† After deduction of income from investments.

The total income from products, after deducting Excise Duty on sugar, was £5,245,396 or 34*s.* 4*d.* per ton of beet, as compared with £4,691,897 or 47*s.* 3*d.* per ton in 1929-30. The fall of 12*s.* 11*d.* per ton of beet was to some extent due to the fact that the sugar-content of beets was lower in 1930-31 than in the previous year. The total profit, including subsidy and profit on subsidiary industries, less cost of beets, manufacturing expenses and overhead charges, was 9*s.* 10*d.* per ton of beet as against 17*s.* 9*d.* in 1929-30—a fall of 7*s.* 11*d.* per ton.

In relation to the total capital employed, the amount distributed in dividends and interest, less interest received from investments, was 7 per cent., the amount applied to writing down the fixed assets 6·4 per cent., and the amount placed to reserve, including unappropriated balances, 2·9 per cent.

The profits made by the factories during the year on their subsidiary industries—farming, refining imported raw sugar, molasses desugarization and the manufacture of fertilizers—showed a considerable increase on the previous year. The total profits were £134,137 and losses £1,222 making a net profit of £132,915, compared with a net profit of £26,105 in 1929-30.

* * * * * *

NOTES ON PRICES AND SUPPLIES*

R. J. THOMPSON, C.B., O.B.E.

IT is now nearly two years since agricultural prices entered on the present period of depression, and, although it would be rash to assume that the worst is over, it is satisfactory to see that with a few commodities—*e.g.*, wheat, barley, oats, cheese, and wool—prices are at or above the level of a year ago, while potatoes are fetching exceptionally good prices. All kinds of live stock and meat still remain very depressed in value, but they appear to have reached a position where prices seem more likely to rise than to fall. On the other hand, unless the milk contract rates for February and March are revised upwards, the decline in receipts for milk will more than counterbalance any probable gains in other directions. The demand for accommodation milk, which was very brisk in December, fell away early in January, only small quantities being sold at 1*s.* 2*d.* to 1*s.* 5*d.* per gal.

The improvement in the prices of barley, oats, and cheese has, moreover, brought them approximately to the level of January, 1930, though most other commodities remain far below the values which were regarded as normal two years or so ago. Wheat is down by about 40 per cent., while fat cattle have fallen by 8*s.* 6*d.* per cwt. or 16 per cent., and sheep by 4¾*d.* per lb. or 33 per cent. In the case of pigs, prices two years ago were exceptionally high and do not afford a very reasonable basis for comparison, but if the January average

* Written mid-January.

of the three years 1928–30 is taken, present rates for pigs, pork and bacon all show a decline of fully 30 per cent.

	January, 1932	*January*, 1931	*January*, 1930
	s. d.	*s. d.*	*s. d.*
Wheat, *Gazette* average, per cwt. ..	5 10	5 7	9 7
,, No. 2 Manitoba ,, ,, ..	7 1	5 8	12 2
,, Argentine ,, ,, ..	6 3	4 11	10 9
Barley, *Gazette* average, per cwt. ..	8 2	8 1	8 6
Oats, ,, ,, ,, ,, ..	6 11	5 9	6 11
Fat cattle, first quality, ,, ,, ..	45 7	48 9	54 1
Beef, English N.M. Prime, per lb. ..	0 7¼	0 8	0 9
,, Argentine chilled, H.Q. per lb. ..	0 5⅝	0 7⅜	0 8⅛
Fat sheep, first quality, per lb.	0 9¾	1 1	1 2½
Mutton, English, per lb.	0 8¼	0 11¼	0 11⅝
Lamb, New Zealand, per lb.	0 7¾	0 9⅛	0 9½
Bacon pigs, first quality, per score ..	10 2	14 2	19 6
Bacon, Danish green, per cwt.	56 0	70 0	116 0
Pork pigs, first quality, per score ..	12 9	17 10	22 1
Pork, English, per lb.	0 8¼	1 0	1 2½
Butter, New Zealand, per cwt.	107 0	122 0	164 0
Cheese, Dairy Cheddar, per cwt... ..	110 0	95 0	110 0
,, New Zealand ,, ,, ...	61 6	63 6	89 0
,, Canadian ,, ,, ...	74 0	82 6	102 0
Eggs, N.M. Standard, per 120	17 9	19 3	18 6
Potatoes, King Edward, Lincs and Yorks, per ton	280 0	160 0	90 0
Wool, Southdown, per lb. at Bradford ..	1 1½	1 1½	1 11

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending January 13, 1932, and in corresponding weeks in the two preceding years. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

Influence of Heavy Imports on Prices.—The influence of exceptionally large production abroad as a factor in depressing prices has been particularly marked during the past year, and can be seen not only in wheat, but also in most kinds of feeding stuffs, and in pork, bacon, mutton, lamb, butter and cheese. In the case of wheat the enormous surplus which had first accumulated in 1929 was actually increased in 1931, so that the world stock remaining at the end of the season was estimated as 546 million bus. as compared with 300 million bus. in 1928, with the result that prices fell in the course of the past year to a point substantially lower than in 1930. Although the position has not yet very materially improved, and is still highly uncertain, the present year should see a betterment in the world wheat situation provided the next harvest is not above normal. The stocks held by the U.S. Federal Farm Board, however, amounted at the beginning of November last to 190 million bus., and are only being very slowly reduced, so that the next cereal year is almost certain to begin with a heavy though somewhat

smaller carry-over. The immense size of this stock will be realized when it is observed that it is equal to five times the 1931 crop of England and Wales.

Feeding stuffs had already become very cheap in 1930, partly in sympathy with wheat and partly as a consequence of the large production of rye, barley and oats in Europe, and in 1931 this plentiful supply was augmented and continued by an altogether exceptional maize crop in Argentina. To take advantage of this low-priced grain, pig-keeping in Denmark and other European countries was rapidly increased and led to the flooding of the English market with cheap bacon in 1930–31. The extent to which this operated can be seen in the imports, which rose from 8,278,000 cwt. in 1929 to 9,191,000 cwt. in 1930, and to 11,138,000 cwt. in 1931, an increase of over 34 per cent. This large supply not only had the effect of lowering the prices of bacon and pork and of all classes of pigs, but it also affected indirectly other kinds of meat. The Continental supply of feeding stuffs is somewhat reduced this year, and some lightening in the bacon supplies may result, though there is not at present any definite evidence of a decline.

Frozen lamb from Australia, New Zealand and the River Plate was also in plentiful supply in 1931, and had a very depressing effect on sheep and mutton prices, especially in certain months. The total imports of frozen mutton and lamb amounted to 7,112,000 cwt. in the past twelve months, as compared with 5,631,000 cwt. in 1929, an increase of 26 per cent.

Another commodity of which the importation has been abnormal is butter, 8,071,000 cwt. being received against 6,397,000 cwt. in 1929, an increase here also of 26 per cent. Prices were consequently much reduced, and in addition the large production of butter in Australia and New Zealand had the indirect effect of depressing factory cheese prices, both Canadian and New Zealand grades declining heavily, thus bringing down the price of "manufacturing" milk, which for several months in the year stood at only 4½*d.* per gallon.

Altogether prices in this country in 1931 undoubtedly suffered quite severely from abundant production abroad, and owing to the fact that a large proportion of the imported foodstuffs comes from countries not on the gold standard, the change in the currency had little appreciable effect.

Cost of Imported Food Stuffs in 1931.—The figures of total imports attract attention once more to the enormous extent to which this country is dependent on outside sources for

its food supplies. Owing to the universal fall in prices, the total payments in the past year were about 10 per cent. less, but as already mentioned several important products, notably wheat, maize, mutton, lamb, bacon and butter, showed substantial increases in quantity. In the case of wheat, this probably did not indicate any greater consumption, as the larger imports were accounted for partly by reduced home production and partly by an increase in stocks carried over at the end of the year; but in the case of the other products, particularly bacon and butter, consumption was much stimulated by the low prices.

Taking the value at the point of importation, after deducting exports and re-exports, the cost of the foodstuffs purchased to supplement our own production amounted in 1931 to about £282 millions. Dividing this total among the various commodities, grain, flour and cereal products, including grain used as food for live stock, accounted for £54 millions or 19 per cent.; animals and meat of all kinds for £106 millions or 37 per cent.; dairy produce and eggs for £75 millions or 27 per cent.; and fruit, vegetables and miscellaneous produce for £47 millions or 17 per cent. In 1930 the total value of these imports was £319 millions and in 1929 £357 millions. Although the quantities in the two years were somewhat different, the decline in value is mainly accounted for by the fall in prices, and is very similar to the change in the agricultural index number.

The value of the British contribution to the total food supply cannot be very closely estimated, but in 1931 it was probably in the neighbourhood of £220 millions, and if so about 44 per cent. of our requirements came from home sources and 56 per cent. from abroad, proportions which are roughly the same as in recent years.

Increasing Home Production.—The possibility of reducing these imports by a larger production at home has now become an important problem in the financial economy of the country, and the fact that our aggregate output is at present somewhat below figures that have been recorded in the past is evidence that under favourable conditions some increase should not be difficult. On the other hand, the magnitude of the overseas supply is now so great that to provide even 10 per cent. of the imports of the leading commodities would necessitate a substantial permanent expansion in the present area under cultivation and in the existing number of live stock. For some products it would only be necessary to recover the ground lost in

recent years, but with others the provision in this country of even one-tenth of the supply now received from abroad would mean maintaining the output at or above the maximum hitherto reached.

Wheat is of course an example of a crop easily capable of expansion, and to produce the 600,000 tons that form about 10 per cent. of the imported supply, it would only be necessary to get back approximately to the position in 1922, when there were 2 million acres under cultivation as compared with 1,250,000 acres in 1931.

Live stock would present more difficulty. Omitting cattle imported from Ireland and Canada, 10 per cent. of the imports of chilled and frozen beef represents about 1,200,000 cwt., which, taking cattle at an average dead weight of 5½ cwt., is equal to 220,000 head. To supply this extra number annually and regularly from year to year, the stock of cattle (including cows) would need probably to be increased by 550,000 head at least, that is from the 7,270,000 recorded for Great Britain in 1931 to, say, 7,800,000, a figure that is substantially above what has so far been reached in this country, the maximum having been attained in 1927 with 7,485,000 head. The position is very similar in the case of sheep. The imports of frozen mutton and lamb in 1931 amounted to 7 million cwt., and to produce 10 per cent. of this quantity about 1,500,000 additional animals would need to be slaughtered annually representing an increase of, say, 3½ millions in the flocks of Great Britain. In 1931 these numbered nearly 25½ millions and were at their highest point this decade. The addition suggested would, as with cattle, bring the total up to or above the maximum so far recorded.

As regards pig meat, the total imports of bacon, hams, and fresh and frozen pork in 1931 amounted to over 12½ million cwt., which was considerably more than double the output of Great Britain in 1930–31. The home production, however, fluctuates very appreciably, and in England and Wales it has ranged from 6,429,000 cwt. in 1924–25, to 4,599,000 cwt. in 1930–31. The problem here of supplying an additional 1¼ million cwt. (*i.e.*, 10 per cent. of the current imports) consists not so much in any exceptional increase in the supply of pigs as in preventing the alternate increase and decrease every two or three years which has always been such a marked feature of the pig industry ; for example, the number of pigs, which in 1924 was 3,228,000, fell in 1926 to 2,200,000, and after rising and falling again in 1928 and 1930, stood at 2,778,000 in 1931. If

the pig population could be maintained year in and year out at the 1924 figure, when the number of breeding sows was 449,000, the home supply of pig meat would certainly be increased by an amount fully equal to 10 per cent. of the current imports from abroad. The obstacle under existing conditions lies in the wide fluctuations in price that alternately stimulate and then discourage production. Given a steady price for pork and bacon, there seems no reason why the supply should not be maintained at the level of 1924, thus providing sufficient pigs not only for the fresh pork market but also for a permanent expansion in the output of bacon.

These figures merely suggest one side of the problem: the maintenance of the larger number of animals represented by the extension in the production of beef, mutton and pig meat would also involve an increased cultivation of barley, oats and fodder crops, to avoid dependence on imported feeding stuffs. The larger number of cows would result in an augmented supply of milk, which, theoretically, could be used in the production of butter and cheese, but would obviously have reactions on the price of liquid milk.

Altogether, it is clear that such a development in the output as would enable the soil of this country to provide one-tenth of the present imports of foodstuffs from abroad would be a very notable achievement. Its possibility in practice is probably dependent not only on such a change in economic conditions as would give farmers solid confidence that moderate and stable prices were assured over a number of years, but also on a reorganization of marketing methods.

Wheat.—Trade in wheat has been comparatively featureless since the beginning of the new year. Prices have been fairly steady for some weeks past, but were weakening in the middle of January, and the Liverpool March future, which was fluctuating round about 5*s*. 5*d*. per 100 lb. a month ago, was down to about 5*s*. 1*d*. on January 15. The new crops from Argentina and Australia are now affecting the market, and with plentiful supplies, prices are inclined to be cheaper.

The International Institute of Agriculture has received revised estimates of wheat production in certain countries in 1931, and these have the effect of raising the world output by 30 million bus. The theoretical surplus available for export, quoted in these notes in December last at 1,240 million bus., is now put at 1,280 as against 1,350 million bus. in 1930–31. This, of course, has the effect of increasing the probable stock remaining at the end of the current season.

World shipments continue in the aggregate at about last year's level, but European purchases are on a very restricted scale, and so far there is little evidence of any increased buying. Until France, Germany and Italy begin to buy more largely than at present, little improvement in prices seems likely. Imports into the United Kingdom in December were reduced as compared with the previous month, and as a consequence, port-held stocks that were at a maximum at the beginning of December were lighter in January.

Maize.—The supply of maize during the past 12 months has been quite exceptional—imports into the United Kingdom reaching the enormous total of 53¼ million cwt. The nearest approach to this total was in 1927, when 42 million cwt. were received, but in the intervening years the receipts have been about 30–35 million cwt. Of the total this year, 48¼ million cwt., or 90 per cent., came from Argentina and the remainder chiefly from South Africa, and from Roumania and other Danubian countries.

The total exports from Argentina to all destinations in the first 40 weeks of this season have amounted, according to the *Corn Trade News*, to 39 million qr. (167 million cwt.) or nearly 1 million qr. per week, and the balance that remains for shipment up to the beginning of April next, when the new crop begins to move, appears on the basis of the official crop estimate to be only some 3 million qr. Actual shipments, however, though reduced, are still being made on a relatively liberal scale. Prices in the next month or two should be firm, but the tendency is largely dependent on the prospects of the new crop. So far no estimate of the area planted is available, but it is expected to be in excess of that of last year, while the condition of the growing crop is favourable. There is, therefore, the possibility of another heavy crop in Argentina, though it is not at present more than a possibility. Complaints of the low prices obtained for maize have been very general in Argentina this season, but if a larger area has actually been planted, the results cannot have been entirely unsatisfactory to growers. The reduction in price has certainly given rise to a very brisk demand for maize in this country and in Europe, and, as already mentioned, has had a material influence in encouraging an increase in the pig population. If there should be another large crop in Argentina with a continuance of low prices for another year, it would probably tend to maintain this increase for a time, whereas it would otherwise be checked by smaller supplies and higher prices.

As regards other exporting countries Roumania and adjacent countries in the Danubian basin are of some importance. The Roumanian 1931 crop is estimated at 236 million bus. as against 178 million bus. in 1930, giving a nominal surplus of some 100 million bus. Navigation on the Danube, however, is now more or less suspended, and exports will not be resumed in quantity until the spring. Moreover, although there is a large theoretical surplus, exports in previous years, when the crop has been equally large, have not actually reached this figure; on the other hand, the fact that the Argentine supply is likely to be light until May next may stimulate the early marketing of Danubian maize. The United States had a fair crop in 1931, but this has little influence on the markets as the export of maize from North America is unimportant. The Department of Agriculture states, however, that there is evidence of expansion in pig-breeding, and this may result in larger exports of pig meat, which in 1931 were much below normal.

Barley.—The world production of barley in 1931 was one of the smallest in recent years, the estimates for the principal countries as issued by the International Institute of Agriculture showing a total of only 1,223 million bus. as compared with 1,444 million bus. in the preceding year, the decline being most pronounced in Canada and the United States. This reduction has had the result of raising prices from the very low level to which they fell last season to approximately the rates ruling in 1930; for example, early in the present January English feeding barley was quoted at 6*s.* 1*d.* to 6*s.* 9*d.* per cwt., as compared with 4*s.* 4*d.* to 5*s.* 6*d.* per cwt. in the same period in 1931, and 6*s.* 10*d.* to 7*s.* 3*d.* in 1930. In speaking of the poor prices obtained for barley in the past year, however, it is as well to bear in mind that on the average they were not so disastrously low, either actually or relatively, as was the case with wheat. Taking all qualities of barley, malting and feeding, as shown by the Corn Returns during the past twelve months, the average was 7*s.* 11*d.* per cwt., which was the same as in 1930 and also the same as the pre-war average of 1911–13. Wheat, on the other hand, only averaged 5*s.* 9*d.* per cwt., or nearly 25 per cent. below the pre-war average of 7*s.* 7*d.* and 2*s.* 3*d.* below the 1930 average.

The smaller crops combined with the ample supplies of maize have tended to limit shipments of barley from exporting countries this season, and the imports into the United Kingdom

in the four months September to December only amounted to 7,190,000 cwt. compared with 8,732,000 cwt. last year. Russia has been the chief source of supply this season, receipts from the United States, Canada, Roumania and elsewhere being reduced. The markedly smaller quantity available in North America is shown by the change in the visible supply, which early in January, both in Canada and the United States, only amounted to about one-third of last year's figure. The new crop from the River Plate is now coming on the market. The first forecast of the 1931–32 output in Argentina is 410,000 tons as compared with 348,000 tons in the previous year. Of this latter quantity about 200,000 tons were exported in 1931, and probably a somewhat larger proportion of the present crop will be shipped, as the price is relatively higher than that of maize and better than in the past year.

Oats.—Although oat prices in 1931 were below pre-war levels, the average for the calendar year at 6*s.* 3*d.* per cwt. was practically the same as that for 1930. Rather better rates were ruling early in January, the *Gazette* average being 6*s.* 11*d.* per cwt. Prospects for the present season are certainly more favourable than at this time last year.

The total production of oats in England and Wales in 1931 was over 2 million cwt. less than in 1930, so that larger imports will be required to bring the supply up to last year's figures, but landings so far this season have been much below last year, and receipts in November and December were particularly light.

The world's crop of oats is generally poor, European production being under average, while in both Canada and the United States the crop is one of the smallest in recent years. In Argentina, however, the first forecast of the output for 1931–32 is 950,000 tons as against 765,000 tons last year, so that there is a prospect of liberal shipments from this source.

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FEBRUARY ON THE FARM

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FEBRUARY "fill-dyke" is traditionally a wet month, but rainfall statistics of recent years do not support this view. The dank atmosphere and the normal surface wetness of the land, as a result of the previous winter rains, give an impression of dampness that is not directly dependent on the actual rainfall experienced. In normal years a wet February does not alarm the farmer; there is a widespread belief prevalent in the countryside that rainy conditions in this month will increase the chances of a dry March. Should, however, the previous autumn have been so wet as to interfere seriously with planting of winter corn and to delay cleaning operations, drier conditions in February are specially welcomed to enable an early start to be made on the arrears of work.

Seasonable Operations.—As a result of a favourable autumn last year, work in general is well forward. If it should prove possible to obtain a satisfactory tilth, spring wheats may be sown. Notes on this subject were given in this JOURNAL last month.

Spring oats are much more widely grown than winter varieties, and, except in cold exposed situations, may be sown at any time after the beginning of February. The chance of sowing early should not be missed when such an opportunity occurs; both experiment and practice indicate that sowing in February, under normal farming conditions, will bring the largest crop and the most profitable return. When sown early, oats suffer less from wireworm or frit-fly attack than when sown late; charlock is less in evidence; and on account of their greater root development they are not so adversely affected by a drought in early summer. Again, they are not so likely to lodge—an important feature. Varieties of this crop recommended by the National Institute of Agricultural Botany are given on page 1096 of this issue. The County Agricultural Organizer is in a position to advise farmers as to varieties to suit their own particular conditions.

Grass Land.—Adequate surface cultivation of grass land is now admitted to be an essential adjunct to any system of manuring, and this applies with greater force to the poorer pastures having a surface mat or carrying coarse grasses and tufts. Such operations are essentially work for the winter months, and are likely to be more effective and give quicker

results when as much as possible of the grass has been grazed off before work with implements is commenced.

Wherever the ground is dry enough to carry horses or tractor, mechanical treatment of the grass land can be proceeded with, and although it is possible to continue such work into March, there are distinct advantages in getting ahead now. Next month more urgent matters may be pressing; the soil needs time to settle down in preparation for the spring growth of grass.

Farmers are frequently rather nervous of subjecting their fields to the really drastic treatment that many of these need, and it must be admitted that there is something to be said for this point of view in relation to land carrying a good sward of high quality grasses and clovers. Unfortunately the same tendency prevents surface cultivation being carried out on much second-rate land that would undoubtedly benefit. With matted pasture, the destruction of the mat is essential, or manures applied will be unable to reach the soil itself—and under such conditions good grasses will not grow.

In discussing the desirability of carrying out such work with farmers, the view is frequently put forward that the land in question is too wet throughout a large part of the winter to enable the necessary cultivations to be done. Where such conditions are really bad nothing short of thorough drainage will cure the evil, but many farmers on a clay subsoil might well consider the possibilities of mole draining as carried out with the modern type of machine; this work is much less costly than it was some years ago. There can be little doubt that many of the disappointing results of mole draining in the past were due more to mistakes in the technique of the work than to the system itself.

Properly cleared and well dug ditches are a greater aid in drying pastures of surface moisture than is often appreciated, and there are few grass districts in this country to-day where improvements could not be brought about in this way.

Phosphatic and potash manures must be applied quickly now if they are to be effective in the coming growing season. The end of the month is not too early to top dress a portion of the grass land for the encouragement of early grass, and both sulphate of ammonia and nitro-chalk are widely used for this purpose, although perhaps the former is preferable for a February application.

Live Stock.—A careful watch should be kept on out-wintered cattle, as often at this time of the year animals that are not

organically or constitutionally sound show the first indications that all is not well. The experienced eye at once notes a difference between such stock and those that, although perhaps in backward condition, are sound.

The universal use of some form of concentrated food for outdoor stock is not advised, and it has been repeatedly shown that store stock to which a minimum of help has been given in this way during the winter make quicker and better use of the grass in fattening during the following summer.

The much more general practice of a daily foddering of hay, or hay and roots, is sound, except perhaps in the case of strong stores on adequate grass.

There is a considerable difference of opinion among dairy farmers, particularly in the southern and south-western counties, as to whether the housing of milking cows at night during the winter is always a sound practice. Undoubtedly the outdoor system is growing in favour.

Briefly, the advantages of always keeping the dairy herd outside are said to be: (1) cows are healthier and the incidence of tuberculosis is reduced; (2) litter is saved—an important point to-day on a grass farm—and it is easier to produce really clean milk; (3) cows suffer less from "colds" in the udder; (4) it does not appreciably affect the milk yield; and (5) less labour is required.

Those who advocate bringing in the cows at night state in support of their method that: (1) cows milk better; (2) excessive treading of the pastures is avoided; (3) statistics show little actual difference in the amount of tuberculosis infection; and (4) for equivalent results actually less food is needed.

To the impartial observer it is obvious that this is a matter upon which there can be no hard and fast rule, even on farms in the same district. During a reasonably dry and mild early winter, cows can be left out later than is usual without deleterious effects to themselves, their yield, or to the pastures. The problem is largely one of two factors: firstly, the surface condition, shelter facilities, and quality of the pasture available; and secondly, the milking capabilities of the herd itself, in that heavy-yielding cows cannot be expected to maintain a high output if subjected to the rigorous weather conditions that occur from time to time, whereas lower yielders are not so sensitive.

The modern tendency is towards shortening the laying-in winter period by allowing the cows to remain out later in the

early winter wherever possible, and by earlier acclimatization in the spring, to enable the herd to take advantage of earlier grazing facilities.

Fences.—On stock and grass farms attention might well be given to the fences, where this has not been done. It is not sound practice to allow grazing stock to roam from one field to another, as so frequently occurs where gaps and broken places in the hedges have not been made good. Under such conditions proper control of the grazing is impossible, and too often deterioration of the pastures follows, with consequent reduction of stock-carrying capacity.

The plashing or layering of hedges can be done any time from October to the spring, but it is better to do the older and grosser hedges in the early spring, as at this time the stems and branches are more pliable and more easily handled.

Poultry.—The rapid development of the poultry industry, which has been such a feature of recent years, continues. In spite of the period of financial stringency through which we are passing a large amount of money appears to be available for investment in poultry farming.

February and March are months of great activity in the breeding pens and incubator room; and preparations are being made for the reception of the chicks in the brooder houses. We do not nowadays defer hatching until the spring in the hope of more favourable weather for the young birds. Modern methods enable us, to a considerable extent, to be independent of weather conditions during the first few weeks of the chick's life. Severe weather at this time does, however, reduce the activity of the breeding stock and therefore affects the fertility of the eggs. Such stock in slatted-floor houses may suffer in exposed situations, and every effort should be made to give them opportunities for shelter and exercise. Intending purchasers of day-old chicks or young pullets for delivery later in the year should make early inquiries of breeders.

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NOTES ON MANURES

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Calcium Cyanamide.—This form of nitrogen is used on a very extensive scale on the Continent, and during recent years experience with cyanamide on English soils has been accumulating. A few notes on this fertilizer may be of interest at this time; for, owing to its somewhat slow action and its caustic effect on germinating seeds and young vegetation, cyanamide should be incorporated with the soil well before sowing time, so that it will be available when required by the young plant without risk of damage.

Experiments comparing the action of cyanamide with that of equivalent sulphate of ammonia have been carried out at Rothamsted and other centres with barley, at Woburn and other centres with potatoes, and at various centres with sugar beet. It is not necessary to set out the data in full. Interest chiefly centres on the increases produced by sulphate of ammonia and cyanamide respectively, compared with no nitrogen.

Barley.—In the case of barley we have nine comparisons available over the years 1927-30. The mean yield with sulphate of ammonia was quite good, being 38·7 bus. grain and 24·4 cwt. straw per acre.

Centre	Increase over no nitrogen (cwt. per acre)				Increase for cyanamide S.A.=100		Quantity of sulph. amm. per acre
	Sulph. amm.		Cyanamide				
	Grain	Straw	Grain	Straw	Grain	Straw	cwt.
Rothamsted, 1927	5·2	5·0	6·2	5·4	119	108	1
	7·1	6·8	6·1	7·3	85	108	2
,, 1928	3·5	7·7	2·4	4·4	40	57	1
	3·0	10·1	4·5	9·4	150	93	2
,, 1929	3·0	3·6	3·5	3·2	116	89	1
	5·1	4·6	6·2	5·3	122	112	2
,, 1930	3·7	3·2	1·8	2·7	49	84	2
Wellingore, 1930	6·1	7·7	5·3	6·1	87	79	1
Sparsholt, 1930	0·8	0·7	0·5	0·7	62	100	1

The mean increase for grain is 4·2 cwt. for sulphate of ammonia and 4·1 cwt. for cyanamide, for straw it is 5·5 cwt. for sulphate of ammonia and 4·9 cwt. for cyanamide. The relative effectiveness of cyanamide when sulphate of ammonia is put at 100 is therefore 97 for grain and 87 for straw. These increases worked out per 1 cwt. of sulphate of ammonia are 5·8 bus. grain and 3·8 cwt. straw, the corresponding figures for 1 cwt. of cyanamide being 5·6 bus. and 3·4 cwt. We may conclude that cyanamide is a satisfactory source of nitrogen for barley under the conditions investigated.

Potatoes.—For potatoes, we have eight comparisons over the years 1926-31, when the mean yield with sulphate of ammonia was 9·1 tons per acre. The figures are as follows :—

	Increase over no nitrogen (tons per acre)		Increase for cyanamide S.A.=100	Wt. of sulph. of ammonia cwt.
	Sulph. amm.	Cyanamide		
Woburn, 1926	0·88	0·76	86	1
	1·25	1·36	108	2
,, 1927	0·64	0·36	56	1
	0·10	0·20	—	2
,, 1928	2·22	0·83	38	1½
	1·91	1·70	89	1
Bakewell, 1931	1·65	1·40	85	2
Welshpool, 1931 ..	3·17	2·48	78	3

The mean increase, over all levels of manuring and all centres, is 1·45 tons of potatoes for sulphate of ammonia and 1·14 tons for cyanamide, giving a ratio of 100 : 78. The increases per cwt. of fertilizer are 17·2 cwt. and 13·5 cwt., respectively, and there is indication in these results that, on the whole, cyanamide is slightly less effective for the potato crop than sulphate of ammonia.

Sugar-Beet.—There are five experiments with sugar-beet that admit of comparisons between cyanamide and sulphate of ammonia, the average yield with sulphate of ammonia being 11·8 tons of roots and 18·0 tons of tops. The results are as follows :—

	Increase over no nitrogen (tons per acre)				Increase for cyanamide S.A.=100		Wt. of sulph. amm. used cwt.
	Sulph. amm.		Cyanamide				
	Roots	Tops	Roots	Tops	Roots	Tops	
Colchester, 1928	1·32	—	0·70	—	53	—	3
Welshpool, 1929	1·90	4·60	2·20	2·7	116	59	3
,, 1930	1·73	4·75	0·37	1·71	21	36	2
Wye, 1930 ..	1·83	3·46	2·04	4·25	111	124	3
,, 1931 ..	Nil	0·74	Nil	1·24	100	168	2

The results with sugar-beet are rather variable, but the mean increase produced is 1·38 tons of roots and 3·39 tons of tops for sulphate of ammonia, and 1·06 tons and 2·47 tons respectively with cyanamide, giving a ratio of 100 : 77 for roots and 100 : 73 for tops. Cyanamide has never been significantly better than sulphate of ammonia, but at Welshpool, in 1930, it was definitely inferior.

Further evidence comes from the well-known series of experiments carried out by A. W. Ling and C. W. Linley in the Bristol province in 1928. With an average of 12·4 tons of roots and about 9·5 tons of tops where sulphate of ammonia was used, the yields expressed in the system adopted in the previous tables are :—

	Increase over no nitrogen (tons per acre)				Increase for cyanamide S.A. = 100		Quantity of sulph. amm. given
	Sulph. amm.		Cyanamide				
	Roots	Tops	Roots	Tops	Roots	Tops	cwt.
Six sandy loams	1·3	3·4	1·4	2·2	108	65	3
Five medium loams	1·0	2·3	0·9	1·8	90	78	3

The average performance of 1 cwt. of each of the manures is as follows :—

	Rothamsted. Outside centres		Bristol experiments. Sandy loam		Medium loam	
	Roots (cwt. per acre)	Tops	Roots (cwt. per acre)	Tops	Roots (cwt. per acre)	Tops
1 cwt. Sulph. ammonia	10·5	27·0	8·7	22·7	6·7	15·3
1 cwt. Cyanamide	8·1	19·8	9·3	13·7	6·0	12·0

It is important to remember that the best effect of cyanamide is only obtained if it is applied some time before the seed. A safe guide is to allow a week's interval between sowing the manure and the seed for each hundredweight per acre of cyanamide used. Although cases are on record to show that top dressing cereal crops with cyanamide has not injured the crop, and good manurial effects have been obtained, it is better to use some other nitrogenous manure for this purpose. Root crops should not be top dressed with cyanamide or loss of plant may result. Cyanamide is most conveniently applied with a manure distributor, and it may be mixed with salts of potash or with basic slag. If mixed with superphosphate heat is developed and undesirable changes take place. Owing to its caustic properties calcium cyanamide tends to destroy seedling weeds, and this is an advantage. It has no tendency to set up acidity in the soil as it furnishes a small quantity of active lime. This amounts to about 60 per cent. of the weight of the manure, but this is in no sense a substitute for liming on acid soils.

Manures for Barley.—Provided that a satisfactory seed bed has been obtained, early sowing is a favourable factor in growing a good sample of malting barley. Early manuring is similarly of considerable importance, for it has been shown that nitrogenous manures in particular have a more favourable influence on yield and on quality when given early in the life of the plant than when reserved for top dressings at a later period. The sulphate of ammonia and calcium cyanamide are best applied while the seed bed is being prepared, as they are thus distributed in the soil. Nitrates may be held back for very early top dressings, but there are experiments on record to show that even when nitrate of soda is applied at sowing time its action is at least as good as equivalent sulphate of ammonia.

	No nitrogen		Nitrate of soda		Sulph. of amm.		Sulph. amm. applied
	Grain bus.	Straw cwt.	Grain bus.	Straw cwt.	Grain bus.	Straw cwt.	(cwt. per acre)
Rothamsted, 1929	40·2	20·3	51·2	26·7	46·2	23·9	1
	—	—	55·6	27·4	50·4	24·9	2
Wellingore (Lincs), 1930 ..	20·6	11·5	32.8	19·0	32.8	19·2	1
Sparsholt (Hants), 1930..	26·0	12·6	30·4	15·3	27·6	13·3	1

Two questions now arise: under what conditions is it legitimate to make use of the undoubted crop-producing power of nitrogenous manures; and should the manures be supported by applications of phosphate and potash? As far as the first point is concerned we may say that nitrogen may be used to the extent of about 1 cwt. of sulphate of ammonia or its equivalent per acre whenever it is judged that the barley will stand up under the treatment. For example, a nitrogenous dressing might be given on good land after a previous corn crop, on poor land after carted roots, or even on land in high condition which has been exposed to an open winter with much drainage. A relatively stiff-strawed variety, such as Plumage Archer, enables a little more liberty to be taken in this matter. With regard to phosphate and potash, we may say that these manures are much less striking in their effect than nitrogenous manures under general conditions, and the question has to be judged more from the standpoint of the characteristics of the soil in question and in particular in relation to the quantities of the fertilizers used for previous crops. When there is any doubt it is a safe rule to give a light dressing, say 1½ cwt. of superphosphate and ½ cwt. of muriate of potash, together with the sulphate of ammonia. As mentioned in a previous section, cyanamide should not be mixed with superphosphate. A high-soluble basic slag may be substituted, or the cyanamide may be applied as a separate dressing. Either alone or in mixture cyanamide should go on a week before sowing the seed.

The minerals, even when they do not markedly increase the yield, have certain other desirable qualities of a very definite commercial value.

It is often claimed by farmers that potassic fertilizers improve the straw; this is probably most noticeable on light or chalky soils that are markedly deficient in potash. It is doubtful whether either phosphate or potash, or both, will support a crop already overdone with nitrogen. In the Rothamsted experiments, sulphate of potash slightly raised

the 1,000-corn weight, lowered the nitrogen content, and raised the amount of extract of the barley grain. Superphosphate, by its well-known action of promoting maturity, hastens the barley to harvest and, in this way, no doubt, has a valuable effect in improving quality by avoiding undue exposure to weather at the latter end of the harvest period. The effect of both phosphatic and potassic fertilizers on the young seeds sown in the barley is unquestionably good.

Coal Ashes as Manure.—The question of the fertilizing value of coal ashes comes up from time to time, usually raised by horticulturists who are in doubt about the commonly accepted view that coal ash is at best useless and unsightly, and in most cases actively injurious. From the agricultural standpoint there is no great difficulty. Coal ashes are certainly not valuable enough for manurial purposes to be worth buying; on the other hand, amounts which in reason could be applied to the soil on a farm scale are very unlikely to have an injurious effect. Town refuse which, in winter at any rate, contains probably about half its weight of coal ash, has been used with good results in dressings up to 20 tons or more per acre. Coal ash has been applied year after year for a long period to one of the Rothamsted plots without any ill-effect on yield.

Coal ash is exceedingly variable in composition. In terms of the common plant nutrients it contains:—

Lime.—Expressed as quicklime, this varies from 1·5-16·1 per cent., most samples containing about 8-9 per cent. These figures for lime, which is probably combined with silica and sulphuric acid, give the maximum neutralizing power of the ash. Some of the lime may be of no use for this purpose. Cases are on record in which the neutralizing powers of the ash have been demonstrated, and much of its value on acid soils can be attributed to this cause.

Gypsum.—Some of the calcium in coal ashes is combined with sulphuric acid which is present to the extent of from 0·35-10·4 per cent. Thus 4 per cent. of sulphuric acid (SO_3), which is about the average value, would correspond to about 7 per cent. of calcium sulphate. Gypsum has been used as a fertilizer for centuries, its main effect probably being a replacement action on the soil potash. This constituent of ashes, therefore, may be credited with a small value.

Potash.—This ranges from 0·1-5·0 per cent., but the usual amount is in the neighbourhood of 1-2 per cent. It is not water-soluble and is probably combined with silica. It, therefore, has very little manurial value.

Phosphoric Acid.—The amount of phosphoric acid ranges from 0·1-3·0 per cent., and is usually about 1 per cent. Here, again, the amount is so small as to be of negligible value, quite apart from its very doubtful availability.

Sulphides.—Fresh ashes contain appreciable quantities of sulphides which, until oxidized by exposure to the weather, are injurious to vegetation. These are the constituents to which definitely harmful results can reasonably be ascribed.

It is claimed that the addition of ashes to heavy soils, especially if they are incorporated in stiff sub-soils, improves the texture. This is due to the gritty particles and possibly in part to the action of the basic material. The clinkers formed in hot fires have practically no manurial value, being in coarse condition, but their mechanical effect would be analagous to that of stones or gravel.

There seems to be no evidence with regard to the effect of the unburnt coal or coke on vegetation. It gives an unpleasant appearance to the soil and, from that point of view, its presence in garden soils is undesirable.

Precise experimental work with coal ashes has been scanty; the best known experiments were carried out at Dahlem, Germany, by Professor Heine, in 1916-17. He tried a number of types of coal ashes on horticultural crops in varying amounts. Although cases of damage were noted in the course of a large number of trials, the general findings of his work were favourable to the use of ash in quantities up to 25 per cent. of the soil—a rich garden compost in this case.

One may summarize the rather scanty information by saying that coal ash is useful on soils in need of basic material and having a stiff texture. It should be exposed to the weather before use and is best well dug into the soil or, preferably, the sub-soil. The use of ashes in quantity on the surface cannot be recommended on account of its unsightly appearance. It is well recognized that wood and plant ash in general is an excellent and safe fertilizer for horticultural purposes, and is chiefly valued as a source of potash of which it contains about 10 per cent. In contrast to coal ash, it is seriously deteriorated by exposure, the valuable potash being readily washed out.

* * * * * *

PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended January 13				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	8 14	8 14	8 14	8 14	11 3
,, ,, Granulated (N. 16%)	*	8 14	8 14	8 14	8 14	10 10
Nitrate of lime (N. 13%) ..	*	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	*	7 5*d*	7 5*d*	7 5*d*	7 5*d*	9 4
Sulphate of ammonia :—						
Neutral (N. 20·6%)	*	7 0*d*	7 0*d*	7 0*d*	7 0*d*	6 10
Calcium cyanamide (N. 20·6%)	*	7 0*e*	7 0*e*	7 0*e*	7 0*e*	6 10
Kainit (Pot. 14%)		3 18	3 6	..	3 7*g*	4 10
Potash salts (Pot. 30%) ..		6 0	5 11	..	5 12*g*	3 9
,, (Pot. 20%) ..		4 10	3 18	..	4 0*g*	4 0
Muriate of potash (Pot. 50%) ..		11 6	10 16	..	11 0*g*	4 5
Sulphate ,, (Pot. 48%) ..		13 15	13 4	..	13 7*g*	5 9
Basic slag (P.A. 15¾%)‖ ..	§	2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..	§	2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..	§	..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖	§	2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A. 16%)	§	3 2	..	3 9	2 17*k*	3 7
,, (S.P.A. 13¾%)	§	2 17	2 9	3 3	2 12*k*	3 10
Bone meal (N. 3¾%, P.A. 20½%)	§	8 15	6 15	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)	§	5 19*b*	..	6 0	5 5	..
Burnt lump lime	§	1 4*p*	1 2*l*	1 9	1 19*n*	..
Ground lime	§	1 9*p*	1 8*l*	..	1 18*n*	..
,, limestone	§	1 3*p*	1 6	1 7*m*	..	..
,, chalk	§	..	1 6	..	1 6*n*	..
Slaked lime	§	..	..	2 9*m*	2 10*n*	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra, for lots of 2 tons and under 4 tons 5*s.* per ton extra, and for lots of 1 ton and under 2 tons 10*s.* extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

g Prices shown are f.o.r. northern rails; southern rails, 2*s.* 6*d.* extra.

h Prices are ex-ship; for delivery from store, kainit and potash salts are 6*s.* and muriate and sulphate 10*s.* per ton extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

l Carriage paid 6-ton lots Knottingley. Ground limestone 100% through standard sieve.

m In bags f.o.r. Liverpool. Fineness 45% through standard sieve.

n Carriage paid 4-ton lots London. In non-returnable bags, prices are 5*s.* per ton extra.

p F.o.r. in 6-ton lots Bristol.

NOTES ON FEEDING

W. A. STEWART, M.A. B.Sc. (Agric.),
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Research Work on Nutrition.—Those whose duty it is to try to help and advise the stock feeder have found it practically impossible to keep sufficiently in touch with the enormous amount of research work in nutrition that is being done throughout the civilized world. It is on the application of the findings of useful research that improved practice must be based, and technical advisers, as well as a section of practical stock farmers, should welcome the first number of the new periodical, *Nutrition Abstracts and Reviews*, which has been published by the Imperial Bureau of Animal Nutrition, Rowett Institute, Aberdeen, under the joint editorship of J. B. Orr, J. J. R. Macleod and Harriette Chick, acting in collaboration with some fifty corresponding editors representing about thirty countries. It is stated that the editors and their assistants are reviewing some 450 periodicals. The journal begins with literature published in January, 1931, and the abstracts are arranged in six main sections, so that material of immediate interest to any particular reader is found conveniently grouped under one heading. The journal should be of interest and use to all who are specially concerned with the work of nutrition, and should supply a real need.

Three review articles are contributed to Volume I, and one of these, "The Qualitative Aspects of Nutrition," by J. B. Orr, has special reference to farm animals. Dealing with minor degrees of malnutrition, Dr. Orr points out that the discovery that certain diseases are due to inadequacies in the diet, and that they can be cured by correcting these inadequacies, has marked a notable advance in the science of nutrition. Much ill-health or inability to thrive, a condition perhaps hardly sufficiently severe to be classed as a definite disease, may be due to faulty feeding that is preventable. It is unusual for deficiency disease to be due to the lack of any one single nutrient. It is more commonly due to a partial deficiency of several nutrients. Minor degrees of deficiencies in the diet give rise to minor degrees of malnutrition. Symptoms are: decreased appetite, lowered vitality, dullness of coat, impaired capacity for work or production, and, in growing animals, a sub-normal rate of growth. These symptoms are familiar to the stock keeper, but it is true that similar symptoms may arise from an infection of disease. In view of this, those who have facilities for study-

ing closely the occurrence of such signs of malnutrition under ordinary farm conditions may be able to contribute usefully to existing knowledge of the subject by ascertaining to what extent these signs of ill-health can be correlated with the feeding.

Discussing susceptibility to infectious disease, it is stated that an inadequate diet can produce the derangement of function of certain organs. It is logical to conclude that disturbances in function may adversely affect the defence mechanisms of the body, so that resistance to disease infection is reduced. There is a good deal of evidence that faulty nutrition or deficiencies in diet form an important predisposing factor in the causation of disease.

Where actual quantity of food is abundant, sub-normal rate of growth or failure to produce up to the limit of inherited capacity is probably due to some deficiency in the diet. A limiting factor for health is also a limiting factor for production.

The final objective is the perfectly balanced ration, one in which the essential constituents are present in the right amounts and proportions. Dr. Orr mentions a matter on which there will be a substantial measure of agreement, when he states that research workers have been liable to over-emphasize the special aspect of the subject on which they have been themselves engaged, and inclined to underrate other aspects really of quite as much consequence. It is true that for the successful compounding of the balanced ration and for the giving of useful advice on feeding problems, sound judgment is at least as important as a knowledge of the recent results of research. It might be argued that close and continuous contact with practical stock-keeping is equally essential.

Butter-Fat in Milk.—In past seasons it has been found, from February to May particularly, that farmers in this county experience trouble with milk falling below the presumptive butter-fat standard. In individual instances it has been possible to suggest alterations in management, or feeding, which have had a beneficial effect, but no specific remedy has been satisfactory in all cases. Certain foods, such as rice meal, fed in quantity over a prolonged period, have been associated with low butter-fat percentages, but the problem as a whole is one which presents considerable difficulty. It is interesting to find that Continental experiments have shown some positive effects from the use of certain foods. In the

Netherlands* a trial was carried out on groups of tubercle-free cows in two consecutive years. The feeding value of a daily ration of 5·28 lb. of palm-kernel cake meal, containing 6·7 to 7·2 per cent. of oil, was compared with a mixture of earthnut cake meal and maize meal in the proportions 1 to 3·5 in the first year and 1 to 4 in the second year. The rations were designed to supply equal amounts of starch equivalent and digestible protein. The percentage increase of butter-fat in favour of the palm-kernel group was 0·439 ± 0·025.† The effect of the palm-kernel cake meal in producing more butter-fat was continuous and lasted throughout the whole period of the experiment—about eight weeks.

In another‡ Dutch experiment, coconut cake was tried, to ascertain its effect on butter-fat; 4·4 lb. of coconut cake meal containing 6·9 per cent. of oil were compared with a mixture consisting of 1 part earthnut cake meal and 3·5 parts maize meal. The rations were again calculated to supply equal amounts of starch equivalent and digestible protein. The quantity of milk produced by the groups of cows on these two rations was roughly similar, but there was a percentage increase of butter-fat in favour of the coconut cake group amounting to 0·27 ± 0·033. The effect of coconut cake was also continuous and persisted throughout the trial period of eight weeks. This is not the only instance of Continental experience where coconut cake has shown a stimulating effect upon butter-fat; otherwise one might assume that the earthnut and maize mixture might be exerting a depressing effect. On the other hand, there is no conclusive evidence from British experience that either coconut or palm-kernel products have a specially beneficial effect in this connexion. Nevertheless, in view of Continental experience, the two foods might be given additional trials and their effect on butter-fat carefully observed. Both feeding stuffs are wholesome, and generally suitable for feeding to dairy cows; moreover, they are not usually expensive, palm-kernel products in particular being frequently as good value as any on the market. At the Northamptonshire Farm Institute, kerneline nuts have proved specially useful for out-door feeding to in-calf cows and heifers, and as an ingredient of the ration for breeding pigs on an open-air system.

Current Values.—Hay is still the cheapest feeding stuff. Of foods rich in protein, decorticated cotton-seed meal, soya bean cake, and linseed cake (6 to 8 per cent. oil) are good value at

* E. Brouwer, Agricultural Experimental Station, Hoorn.
† Experimental error. ‡ E. Brouwer, *ibid.*

the time of writing (January 12). Amongst foods in the intermediate or balanced class, palm-kernel products, already mentioned, and maize-gluten feed are relatively cheap. Of the starchy foods, that is, those high in carbohydrates, maize, and maize-germ meal, are attractive in price; while of the home-grown cereals, feeding barley is at the lowest price per unit of starch equivalent.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	6 12
Maize	81	6·8	4 10
Decorticated ground-nut cake	73	41·0	8 5
,, cotton cake	71	34·0	7 15

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·44 shillings, and per unit protein equivalent, 1·76 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 0
Oats	60	7·6	5 0
Barley	71	6·2	5 13
Potatoes	18	0·6	1 7
Swedes	7	0·7	0 11
Mangolds	7	0·4	0 11
Beans	66	20·0	6 10
Good meadow hay	37	4·6	3 1
Good oat straw	20	0·9	1 10
Good clover hay	38	7·0	3 7
Vetch and oat silage	13	1·6	1 1
Barley straw	23	0·7	1 14
Wheat straw	13	0·1	0 19
Bean straw	23	1·7	1 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6*d.* net.

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv. %
Wheat, British	—	—	6 10	0 10	6 0	72	1 8	0·89	9·6
Barley, British feeding	—	—	6 15	0 8	6 7	71	1 9	0·94	6·2
„ Persian	23 6	400	6 12	0 8	6 4	71	1 9	0·94	6·2
„ Russian	23 9	„	6 13	0 8	6 5	71	1 9	0·94	6·2
Oats, English, white	—	—	7 10	0 9	7 1	60	2 4	1·25	7·6
„ „ black and grey	—	—	6 13	0 9	6 4	60	2 1	1·12	7·6
„ Canadian No. 2 Western	23 3	320	8 3	0 9	7 14	60	2 7	1·38	7·6
„ Argentine	18 3	„	6 8	0 9	5 19	60	2 0	1·07	7·6
„ Russian	22 6	„	7 17	0 9	7 8	60	2 6	1·34	7·6
Maize, Argentine	19 3	480	4 10	0 8	4 2	81	1 0	0·54	6·8
Beans, English winter	—	—	5 10§	1 0	4 10	66	1 4	0·71	20
Peas, Indian	—	—	8 0†	0 17	7 3	69	2 1	1·12	18
„ Japanese	—	—	27 10†	0 17	26 13	69	7 9	4·15	18
Dari	—	—	8 10†	0 10	8 0	74	2 2	1·16	7·2
Milling offals—									
Bran, British	—	—	5 17	0 19	4 18	42	2 4	1·25	10
„ broad	—	—	6 7	0 19	5 8	42	2 7	1·38	10
Middlings, fine, imported	—	—	6 12	0 14	5 18	69	1 9	0·94	12
„ coarse, British	—	—	5 15	0 14	5 1	58	1 9	0·94	11
Pollards, imported	—	—	5 15	0 19	4 16	60	1 7	0·85	11
Meal, barley	—	—	7 10	0 8	7 2	71	2 0	1·07	6·2
„ maize	—	—	5 12	0 8	5 4	81	1 3	0·67	6·8
„ „ germ	—	—	6 10	0 13	5 17	85	1 5	0·76	10
„ locust bean	—	—	5 17	0 6	5 11	71	1 7	0·85	3·6
„ bean	—	—	8 0	1 0	7 0	66	2 1	1·12	20
„ fish	—	—	15 0	2 16	12 4	53	4 7	2·45	48
Maize, cooked flaked	—	—	6 12	0 8	6 4	83	1 6	0·80	8·6
„ gluten feed	—	—	6 2	0 15	5 7	76	1 5	0·76	19
Linseed cake, English, 12% oil	—	—	8 17	1 4	7 13	74	2 1	1·12	25
„ „ „ 9% „	—	—	8 10	1 4	7 6	74	2 0	1·07	25
„ „ „ 8% „	—	—	8 5	1 4	7 1	74	1 11	1·03	25
Soya bean cake, 5½% oil	—	—	8 12*	1 13	6 19	69	2 0	1·07	36
Cottonseed cake—									
„ „ English 4½% oil	—	—	5 12	1 3	4 9	42	2 1	1·12	17
„ „ Egyptian 4½% „	—	—	5 2	1 3	3 19	42	1 11	1·03	17
Decorticated cottonseed meal 7% oil	—	—	8 5*	1 14	6 11	74	1 9	0·94	35
Ground-nut cake, 6-7% oil	—	—	7 15*	1 2	6 13	57	2 4	1·25	27
Decorticated ground-nut cake, 6-7% oil	—	—	8 5	1 13	6 12	73	1 10	0·98	41
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	6 15	0 15	6 0	48	2 6	1·34	13
„ „ „ porter	—	—	6 5	0 15	5 10	48	2 4	1·25	13
Dried sugar-beet pulp (*a*)	—	—	5 0	0 6	4 14	65	1 5	0·76	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of December, 1931, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 24*s.* per ton as shown above, the food value per ton is £8 16*s.* Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2*s.* 5*d.* Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1·29*d.* A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6*s.* 10*d.*; P_2O_5, 8*s.* 7*d.*; K_2O, 3*s.* 2*d.*

MISCELLANEOUS NOTES

Empire Preference and the Home Producer

SIR JOHN GILMOUR, Minister of Agriculture and Fisheries, who was accompanied by Earl De La Warr, Parliamentary Secretary to the Ministry, received a deputation on January 14 from the National Farmers' Union, on the subject of Empire preference and the home producer, with particular reference to the situation in connexion with hops, live stock and live stock products. The deputation urged on the Minister that any negotiations with the Dominions on the general subject of agricultural imports into this country should be governed by the principle of first preference in the home market for the home producer. Sir John Gilmour in his reply assured the deputation that the interests of the home agricultural producer would be duly safeguarded in the forthcoming negotiations.

* * * * * *

The Agricultural Index Number

BETWEEN November and December the general level of the prices of agricultural produce rose by 5 points to 17 per cent. above the base years 1911-13, whereas at the corresponding period a year ago there was a fall of 3 points to 26 per cent. above pre-war. The main factors in the rise in the general figure this December were the increased prices for milk and potatoes. Those for butter, cheese and poultry also were higher on the month.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1926 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1926	1927	1928	1929	1930	1931
January	58	49	45	45	48	30
February	53	45	43	44	44	26
March	49	43	45	43	39	23
April	52	43	51	46	37	23
May	50	42	54	44	34	22
June	48	41	53	40	31	23
July	48	42	45	41	34	21
August	49	42	44	52	35	21
September	55	43	44	52	42	20
October	48	40	39	42	29	13
November	48	37	41	44	29	12
December	46	38	40	43	26	17

Grain.—During the month under review the average for wheat fell by 5*d.* to 6*s.* 4*d.* per cwt., and that for barley by 7*d.* to 8*s.* 5*d.* The indices for both commodities moved downwards

by 4 points, that for wheat being 14 per cent. below the level of the base years while barley was 2 per cent. above. Oats, however, were a little dearer at an average of 6*s.* 11*d.* per cwt., and the index figure moved upwards by 1 point on the month, whereas a fall of 3 points occurred at the corresponding period last year.

Live Stock.—Prices of fat cattle were a little higher in December than in the preceding month, but as the rise was proportionately much smaller than in the base years, the index fell by 5 points to 10 per cent. above 1911–13. Similarly, although quotations for fat sheep were unchanged, the index figure was 7 points lower at 6 per cent. above the base period. Bacon pigs continued to cheapen during the month under review with a consequent fall of one point in the index, which now stands at 13 per cent. below the level of pre-war. On the other hand, pork pigs were a little dearer during December and the index figure at 3 per cent. above 1911–13 showed an advance of one point on the month. Quotations for dairy cows were higher during the month under review with a consequent upward movement of 2 points in the index number. Prices for store cattle, sheep and pigs, however, showed a fall, the index for sheep declining by 11 points to 1 per cent. and for pigs by 9 points to 20 per cent. above 1911–13.

Dairy and Poultry Produce.—As a result of the revised terms recently agreed upon by the Permanent Joint Milk Committee, the average price for liquid milk delivered under contract in December was considerably higher than in November, and the index rose by 29 points to 50 per cent. above 1911–13. A year ago the index was 65 per cent. above pre-war. The seasonal upward movement in butter prices continued during December and as this increase was relatively greater than that recorded in the base period, the index number was 5 points higher on the month at 10 per cent. above the level of 1911–13. Similarly the index for cheese was 5 points higher at 11 per cent. above the level of the base period. Eggs, as is usual at this time of the year, were much cheaper, prices being fully 7*d.* per dozen lower than in November, with a consequent fall of 30 points in the index figure, which dropped to 7 per cent. below 1911–13, or the lowest figure recorded since the war. A year ago eggs were 14 per cent. dearer than pre-war. On account of the seasonal demand, quotations for poultry were higher and as a rule the increases were more pronounced than in the base years and the combined index was 12 points higher at 39 per cent. above pre-war.

Other Commodities.—During December prices of potatoes showed a further substantial increase, the index figure advancing by 28 points to 159 per cent. above pre-war, which compares with a figure of 166 per cent. in December, 1924. Hay was a little cheaper during the month under review and the index fell by one point to 23 per cent. below the level of the base period. Wool was a trifle dearer in December, but as this increase was about the same as that recorded in the base period, the index figure shows no change on the month. Apples were dearer during December, owing to the usual seasonal advance, and realised 75 per cent. above pre-war, as compared with 44 per cent. above in December, 1930. Vegetables as a whole were dearer on the month and the relative index moved upwards by 2 points to 38 per cent. above 1911–13. A year ago the level was 27 per cent. above pre-war.

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13

Commodity	1929	1930	1931			
	Dec.	Dec.	Sept.	Oct.	Nov.	Dec.
Wheat	28	—17*	—37*	—24*	—10*	—14*
Barley	7	Nil	18	8	6	2
Oats	2	—20*	—17*	—11*	— 2*	— 1*
Fat cattle	30	20	22	18	15	10
„ sheep	53	44	31	28	13	6
Bacon pigs	64	26	—10*	—12*	—12*	—13*
Pork „	77	53	2	3	2	3
Dairy cows	31	30	20	22	23	25
Store cattle	17	22	23	18	18	17
„ sheep	48	50	33	18	12	1
„ pigs	108	104	29	31	29	20
Eggs	47	14	20	29	23	— 7*
Poultry	34	31	30	30	27	39
Milk	67	65	57	19	21	50
Butter	45	12	7	5	5	10
Cheese	32	16	8	8	6	11
Potatoes	10	49	85	110	131	159
Hay	41	— 7*	—14*	—19*	—22*	—23*
Wool	39	—19*	—30*	—24*	—21*	—21*

* Decrease.

* * * * * *

Wart Disease of Potatoes Order of 1923

Two cases of considerable interest to English potato growers have been heard recently, a Scottish seed-potato dealer being prosecuted by the Ministry for contraventions of the Wart Disease of Potatoes Order of 1923. This Order requires that seed potatoes grown in Scotland and planted in England or

Wales shall be the subject of a certificate issued by the Department of Agriculture for Scotland to the effect that Wart Disease has not been known to have occurred within one mile of the land on which the potatoes were grown; the number of this certificate must be furnished to the buyer.

In the first case, which was taken at Bury St Edmunds on November 26, the defendant, in an invoice relating to a consignment of seed potatoes supplied to a Suffolk firm of seed-potato merchants, had quoted the number of a certificate which had been issued by the Scottish Department; it was proved, however, that the potatoes in question originated from a farm in respect of which the prescribed certificate had not and could not have been issued. A plea of guilty was entered to the two charges of (1) selling potatoes which were not the subject of a certificate, and (2) making a false statement for the purposes of the Order, and the defendant, against whom previous convictions had been proved, was fined £20 in each case.

The second case, which was heard at Wisbech on December 10, involved similar charges, and the defendant again pleaded guilty. The Chairman, in inflicting the maximum penalty of £50 on each count, explained that the Bench fully recognized the importance of securing the strictest compliance with the requirements of the Order and were determined to support the Ministry in its efforts to prevent the spread of Wart Disease.

Growers are reminded that no potatoes may be sold for planting in England or Wales unless they are the subject of one of the certificates prescribed by the Wart Disease of Potatoes Order. Any growers who propose to sell seed potatoes from their 1931 crop and who have not yet obtained the necessary certificate should accordingly make early application for it to the Ministry.

It should also be remembered that the seller of uncertified potatoes is not the only person who can be proceeded against under the Order. Any person who plants tubers selected from consignments of ware potatoes, whether these are of English or foreign origin, renders himself liable to legal proceedings, and he should for his own protection insist on being furnished in writing with the number of the certificate relating to any potatoes which he may use for seed purposes. Imported potatoes may only be sold for planting under licence from the Ministry, and the seller of such potatoes is required to notify the purchaser that the potatoes are imported and may

not be planted or re-sold for planting until a further licence has been obtained from the Ministry.

* * * * * *

Wart Disease Immunity Trials, 1932

THE Ministry will continue during the coming season to test, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, Potatoes and Potato Seedlings as to their immunity from or susceptibility to Wart Disease on the conditions stated below.

The entry form (No. 345 H.D.) obtainable from the Ministry should be filled up and returned to the Potato Testing Station, Ormskirk, Lancs., *with the requisite fees.* Samples must be sent to that Station *as early as possible, but in any case not later than March* 1.

Potatoes are accepted *from English, Scottish and Irish growers* for trial under the following conditions :—

(*a*) Quantity of each stock of Potato to be sent for the first time —50 seed size tubers.

Quantity of each stock of Potato to be sent for the second and for subsequent years—35 seed size tubers.

(*b*) Fees on the following scale are payable in respect of each stock of Potato when first entered for immunity trials :—

Less than 5 samples from one grower 10*s.* per sample.

5 samples or more from one grower 8*s.* per sample up to 20, and 6*s.* for each sample in excess of 20.

These fees are not returnable in any circumstances.

(*c*) The Ministry while taking reasonable precautions to secure satisfactory growth can accept no responsibility for the failure of any variety.

(*d*) The Ministry will take all reasonable precautions to secure that all the produce of the trial plots is fed to stock after being thoroughly mixed together, except such portions as may be needed for exhibition or scientific purposes authorized by the Ministry. The Ministry, however, reserves the right to send tubers from the produce grown at Ormskirk for testing at the official stations of the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

(*e*) All stocks entered for the trials will be tested both in the laboratory and in the field. When the Ministry is satisfied as a result of the trials that a variety is immune from Wart Disease, it will formally " approve " the variety and will issue an official certificate of immunity. Such certificates will not be issued until the variety has been named and until an assurance has been received from the sender that it has been, or is about to be, introduced into commerce. *When a variety tested under a number or letter has been subsequently named and " approved," a sample of* 100 *tubers of the variety as named must be sent to Ormskirk for comparison with the tested stock.* No certificate will be issued for any new variety until it has passed at least two consecutive years' tests without contracting the disease and has been declared by the Synonym

Committee of the National Institute of Agricultural Botany to be distinct from existing varieties.

Potatoes are accepted *from foreign growers* on the conditions (*a*) to (*d*) set out above, but no foreign variety will be formally "approved" and no certificate will be issued until the variety is definitely introduced into commerce in Great Britain.

Trials of Seedlings.—The Ministry desires to encourage the breeding of new varieties of potatoes and in order to provide information for breeders of seedlings it is prepared to accept not fewer than two tubers, and not more than ten tubers, of any seedlings for testing in the laboratory and growing for one season on the trial plots, and to furnish a report on the results obtained, without payment of a fee. These tests, however, will not be considered as forming part of the Immunity Trials proper and will not be reckoned in the minimum period of two years referred to under (*e*). The results of these tests will not be included in any report issued by the Ministry.

GENERAL INSTRUCTIONS: *Carriage.*—Small consignments should be sent by passenger train, carriage paid, or by parcel post; larger consignments should be forwarded by goods train, carriage paid.

Labels.—All consignments should be distinctly labelled. A label bearing the name and address of the sender and name of variety or seedling number should be firmly tied to the bag; in addition a similar label should be placed inside the bag.

Address.—All consignments should be addressed to:—

THE SUPERINTENDENT,
POTATO TESTING STATION,
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY,
ORMSKIRK, LANCS.

Station: Ormskirk, L.M. & S. Railway.

Date of Forwarding.—Consignments should be sent so as to reach the Testing Station as early as possible and in any case not later than March 1.

* * * * * *

Foot-and-Mouth Disease.—The last outbreak of foot-and-mouth disease in Great Britain in 1931 occurred early in October at Graffham, Hunts. The restrictions imposed on the movement of stock as a result of this outbreak were removed on November 2, 1931.

During 1931, there were 97 outbreaks of the disease in Great Britain, as compared with 8 in 1930, 38 in 1929, 138 in 1928, and 141 in 1927. The 97 outbreaks last year involved the slaughter of 3,697 cattle, 5,563 sheep, 1,384 pigs and 4 goats.

The existence of foot-and-mouth disease was confirmed on January 17, 1932, at Norton, Stockton-on-Tees. The usual restrictions have been applied to an area comprising the whole district lying within approximately 15 miles of the infected premises and embracing parts of the counties of Durham and the North Riding of Yorkshire.

Enforcement of Minimum Rates of Wages.—During the month ending January 14, legal proceedings were instituted against four employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Devon ..	Wonford .	0 1 0	1 10 0	7 1 0	1
Kent ..	Wingham .	1 0 0	—	12 10 0	2
Surrey ..	Farnham ..	8 0 0	—	17 17 10	4
Cardigan ..	Newcastle Emlyn	—	0 11 0	6 16 8	1
		£9 1 0	£2 1 0	£44 5 6	8

* * * * * *

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS OF ENGLAND AND WALES

FULL lists of the Agricultural Education Staffs employed by the County Authorities of England and Wales were previously published in the issues of the JOURNAL for April and May, 1928, subsequent changes being notified in the JOURNAL month by month. In consequence of the numerous changes that have occurred in the interim, the full lists, revised to date, are now being republished to meet a request from readers who require them for purposes of reference. A first instalment is given in this issue as under.

ENGLAND

NOTE.—The officers are wholly employed unless otherwise indicated by the following reference marks :—

* Wholly employed by the County Council, but only partially on agricultural education work.

† Partially employed.

‡ Seasonal and other temporary whole-time appointments.

Bedfordshire

Agricultural Organizer	J. W. DALLAS, M.Sc.*
Instructress in Poultry-keeping ..	Miss F. M. HILL, N.D.P.
Manageress of Egg Laying Trials	Miss D. M. JONES.

Various part-time instructors in Bee-keeping are employed.

Berkshire

Agricultural Organizer	G. S. BEDFORD, N.D.A., P.A.S.I.
Assistant Instructor in Agriculture	F. A. COX, B.Sc.
Instructor in Horticulture ..	A. E. BARNES
Instructor in Bee-keeping ..	B. COMYNS BERKELEY
Instructress in Fruit Bottling ..	Miss M. L. HOPE†
Instructress in Dairying	Miss J. MATTHEWS, N.D.D.
Assistant Instructress in Dairying	Miss M. G. WOODS‡
Instructor in Poultry-keeping ..	T. M. PHETHEAN, N.D.P.
Manageress of Egg Laying Trials	Miss G. SLOCOCK‡
Instructor in Farriery	C. S. DOUBLE, A.F.C.L.

Instructor in Hedging, Thatching and Rick Building	G. D. SYKES†
Veterinary Lecturer	G. P. MALE†

Buckinghamshire

Agricultural Organizer	J. PORTER, B.Sc., N.D.A., N.D.D.
Assistant Instructor in Agriculture	E. H. BRANT, B.Sc., N.D.A.
Horticultural Superintendent	A. E. B. LANGMAN, C.D.H.
Assistant Instructor in Horticulture	W. R. W. BARNETT, C.D.H.*
Instructor in Poultry-keeping	E. STEVENS, F.B.S.A.
Instructor in Dairy Husbandry	W. H. THOMAS, C.D.A.
Assistant Instructor in Dairy Husbandry	C. TURNER, N.D.A., N.D.D.
Instructor in Bee-keeping	R. B. TWEEDIE.†

Cambridgeshire

Agricultural Organizer	J. A. MCMILLAN, B.Sc.
Assistant Agricultural Instructor	G. W. CHANNON, N.D.A., N.D.D., B.D.F.D.
Horticultural Adviser	A. T. PASKETT, F.R.H.S.
Assistant Horticultural Instructor	K. V. CRAMP, R.H.S. Dip.*
Instructor in Poultry-keeping	H. ROBINSON, M.C.
Manageress of Egg Laying Trials	Miss E. MOSS.
Instructress in Fruit and Vegetable Preservation	Miss E. EDWARDS.†

Cheshire

Staff of School of Agriculture, Reaseheath

Principal and Agricultural Organizer	W. B. MERCER, M.C., B.Sc., N.D.A.
Lecturer in Agriculture and Vice-Principal	W. A. C. CARR, M.C., N.D.A.
Assistant Lecturer in Agriculture	F. W. HANKINSON, M.Sc.
Lecturer in Agricultural Biology	R. G. DRUCE, B.Sc., B.Agric.
Lecturer in Agricultural Chemistry	J FEATHERSTONE, M.Sc.
Horticultural Superintendent	W. E. SHEWELL-COOPER, N.D.H., C.D.H., F.R.H.S.
Assistant Lecturer in Horticulture	H. FAIRBANK, N.D.H.*
Student Demonstrator in Horticulture	Miss M. HUNTBACH.‡
Lecturer in Book-keeping	S. BARRATT, B.Sc., N.D.A.
Head Gardener, School of Agriculture	D. E. TAYLOR
Lecturer in Poultry-keeping	R. E. LOUCH, N.D.D.
Poultryman	J. A. GREEN.
Student Demonstrator in Poultry keeping	Vacant‡
Chief Instructress in Dairying	Miss N. BENNION, N.D.D.
Assistant Instructress in Dairying	Miss U. A. P. GROVES, N.D.D.
Visiting Lecturer in Sick Nursing	Vacant*
Lecturer in Veterinary Hygiene	T. WILSON, M.R.C.V.S.†
Instructor in Farriery	F. LOVATT†
Instructor in Woodwork	C. BOUCH
Farm Manager	J. JACKSON
Lady Warden (Women's Hostel)	Miss F. FALDER
Matron (Men's Hostel)	Miss J. WALLIS
Other Instructors	
Peripatetic Instructress in Dairying	Miss M. BLACK

Instructor in Horticulture	M. CORFIELD†
Instructor in Pruning	J. West†
Instructors in Bee-keeping	E. W. FRANKLIN† A. J. BLAKEMAN† J. PICKSTON† H. H. BROOK† W. STOKOE†
Instructor in Hedging	G. THELWELL†

Cornwall

Agricultural Organizer	A. GREGG, B.Sc., N.D.A.
Assistant Lecturers in Agriculture	T. DAWSON, B.Sc., N.D.A. J. H. HUMPHREYS, M.Sc. W. G. SANDERCOCK, N.D.A. D. S. CUMMINS, N.D.A.†
Horticultural Superintendent	H. W. ABBISS, D.C.M., M.M., N.D.H.
Assistant Lecturer in Horticulture	W. J. MOYSE, N.D.A.*
Head Gardener (Gulval Experimental Station)	D. McGREGOR
Head Gardener (Tamar Valley Experimental Station)	E. BECKLEY
Chief Instructress in Dairying	Miss A. J. W. NICHOLAS, M.B.E.
Assistant Instructresses in Dairying	Miss S. PHILIPSON, N.D.D. Vacant
Instructor in Poultry-keeping	C. H. TOY
Assistant Instructor in Poultry-keeping and Manager of Egg Laying Trials	H. CARVETH
Instructors in Bee-keeping	A. F. KNIGHT† A. G. HARRISON†

Cumberland and Westmorland
(Joint Staff)

Newton Rigg Farm School Staff

Principal and Agricultural Organizer	J. H. FAULDER, B.Sc., N.D.D.
Vice-Principal	A. MANN, B.Sc.
Warden and Record Keeper	W. E. WATSON, N.D.A.
Horticulture Instructor	H. E. BROOKS, N.D.H.*
Assistant Horticultural Instructor	C. M. ROBERTSON.*
Instructor in Poultry-keeping	M. B. SMITHSON
Poultry Assistant	Miss B. LANG, N.D.P.
Manager of Egg Laying Trials	J. P. EDGAR
Itinerant Instructress in Dairying	Miss L. C. BALL, N.D.D.
Instructress in Dairying	Miss E. M. BLACKBURN, N.D.D.
Instructor in Veterinary Hygiene	R. SIMPSON, F.R.C.V.S.†
Instructor in Carpentry	W. COWPER.†
Instructor in Bee-keeping	I. FARQUHARSON†
Matron	Miss R. B. HALL
Agricultural Instructor (Westmorland only)	L. R. WAUGH, B.Sc.

Derbyshire

Agricultural Organizer	J. R. BOND, M.B.E., M.Sc., N.D.A.*
District Agricultural Lecturers	G. E. LIMB, B.Sc., N.D.A. A. L. STICKLAND, N.D.A., N.D.D., B.D.F.D. R. H. SMITH, B.Sc.

Instructor in Veterinary Hygiene	L. A. B. GRACE, M.R.C.V.S., D.V.S.M.
Horticultural Instructor	W. H. TUCK, N.D.H.
Instructor in Poultry-keeping ..	G. W. BRINDLEY
Instructors in Bee-keeping ..	H. M. LANE†
	H. HILL†
	D. WILSON†
Instructresses in Dairying ..	Mrs. T. E. CAMPBELL, N.D.D.†
	Mrs. A. S. McWILLIAM, M.B.E.†
	Mrs. M. A. SMITH, N.D.D., B.D.F.D.†
Instructress in Domestic Science	Mrs. H. PEGG†
Instructor in Rural Science ..	R. BERKS.*
Manageress of Egg Laying Trials ..	Miss K. N. SPALTON

Devonshire

Agricultural Organizer	C. D. ROSS, B.Sc.
District Lecturers in Agriculture ..	F. C. HAROLD, A.I.C.
	W. WILLIAMS, M.Sc.
	G. D. STEVENSON, Dip. Agric., N.D.A., N.D.D.
	D. ROWE, N.D.A.
Lecturer in Agricultural Chemistry	W. G. E. QUICK, B.Sc., A.I.C.*
Horticultural Superintendent ..	D. MANNING, Dip. Hort.
Horticultural Instructor	A. E. GUNNINGHAM*
Assistant Horticultural Instructor	S. A. WESCOTT*
Women's Horticultural Instructress	Miss E. W. GUNNELL, N.D.H.
Foreman, Tamar Valley Horticultural Station	F. W. G. BRYANT
Chief Instructress in Dairying ..	Miss E. BRAY
Assistant Instructress in Dairying	Miss U. A. RIDGWAY, N.D.D., B.D.F.D.
Instructress in Rural Science (Dairying and Poultry-keeping)	Miss M. E. CUMMING, N.D.D., C.D.P.*
Instructor in Poultry-keeping ..	E. RUSSELL
Assistant Instructor in Poultry-keeping	R. D. H. BRIDGE, C.D.P.
Instructress at Travelling Poultry School	Miss I. M. UNKLES, N.D.D., C.D.P.
Manager of Egg Laying Trials ..	C. M. HOLMES
Instructor in Farriery	J. HILL, R.S.S., A.F.G.L., F.W.C.F.†

Local Instructors in Veterinary Hygiene, Farm Accounts and Agricultural Processes are engaged as required.

Dorsetshire

Agricultural Organizer	T. R. FERRIS, M.Sc., N.D.D.*
Senior Instructor in Agriculture ..	R. WIGHTMAN, B.Sc.
Junior Instructor in Agriculture ..	(To be appointed)
Instructor in Horticulture ..	T. P. P. McPHAIL, F.R.H.S.
Instructresses in Dairying ..	Miss E. BUCKNELL, N.D.D.
	Miss L. M. STANGER, N.D.A., N.D.D.
Instructor in Poultry-keeping ..	A. TURNER
Manager of Egg Laying Trials ..	C. F. ELLIOTT
Instructors in Manual Processes ..	W. MARTIN†
	W. CLOTHIER†
	W. E. THOMAS†
	W. MALE†

Durham

Agricultural Organizer	J. WALKER, M.A., B.Sc.
Instructor in Horticulture ..	W. S. SHARP, F.R.H.S.
Assistant Instructor in Horticulture	L. BUSS
Instructor in Poultry-keeping ..	H. WIGNALL, N.D.A., N.D.D.
Instructress in Dairying	Miss M. H. STEWART, N.D.D.
Assistant Instructress in Dairying	Miss R. TOWNEND, N.D.D.
Farm Bailiff, Houghall Farm ..	J. WILSON
Record Keeper, Houghall Farm ..	P. MARRIOTT
Manageress of Egg Laying Trials ..	Miss W. ALLISON

Essex

East Anglian Institute of Agriculture, Chelmsford

Principal and Agricultural Organizer	J. C. LESLIE, M.A., B.Sc.
Senior Lecturer in Agriculture ..	A. HAY, N.D.A., N.D.D.
District Lecturers in Agriculture and Assistant Agricultural Organizers	D. J. EWING, B.Sc. R. P. HAWKINS, B.Sc., N.D.A. R. N. SADLER, N.D.A., N.D.D.
Lecturer in Veterinary Hygiene ..	Lt.-Col. H. A. REID, O.B.E., F.R.C.V.S., D.V.H., F.R.S.E.†
Lecturer and Adviser in Agricultural Biology	R. ROBSON, M.Sc., F.Z.S.
Lecturer in Agricultural Biology ..	J. BRYCE, B.Sc.
Assistant Lecturer in Agricultural Biology	Miss M. E. PIRRIE, B.Sc.
Lecturer and Adviser in Agricultural Chemistry	F. KNOWLES, F.I.C.
Assistant Lecturers in Agricultural Chemistry	F. W. F. HENDRY, B.Sc., A.I.C. J. E. WATKIN, B.Sc., Ph.D., A.I.C.
Lecturer in Horticulture	H. FRASER, N.D.H., F.R.H.S.
Lecturer in Commercial Horticulture	O. G. DOREY, B.Sc.
Assistant Lecturer in Horticulture and Fruit Preservation ..	Miss E. W. JAMESON, N.D.H.
Temporary Student Assistant in Horticulture	Miss D. M. SAUNDERS ‡
Head Gardener	F. W. SHEMMING
Instructress in Dairying	Miss E. M. WATSON, N.D.D.
Assistant Instructor in Dairying ..	R. J. FLEMING, N.D.D., B.D.F.D.
Instructor in Poultry-keeping ..	A. E. HOLMAN, F.B.S.A.
Assistant Instructress in Poultry-keeping	Miss V. D. HARRISON, N.D.P., N.D.D.
Manageress of Egg Laying Trials ..	Miss K. M. PHIPPS
Manager of Poultry Station ..	E. E. WANSBURY
Instructor in Carpentry at Poultry Station	E. C. DINES.†
Matron of Hostel	Miss A. E. ALDERSON

Gloucestershire

Agricultural Organizer	E. REA, N.D.A., N.D.D.
Instructor in Agriculture ..	C. COMELY, M.C., M.R.A.C.
Assistant Instructor in Agriculture	T. H. LUNSON, N.D.A., N.D.D.
Instructor in Horticulture ..	J. COOMBES, N.D.H.
Instructress in Dairying	Miss A. COLNETT, N.D.D., B.D.F.D.
Instructor in Poultry-keeping ..	E. A. KING

Assistant Instructor in Poultry-keeping	G. W. MORLEY
Instructor in Cider-making	J. W. PULLIN†
Instructor in Basket Making	F. PORTLOCK†
Instructor in Hedging and Thatching	G. D. SYKES†

Hampshire

Sparsholt Farm Institute and County Staff

County Agricultural Organizer	L. G. TROUP, B.Sc.
Assistant Agricultural Organizer	D. C. BOWER, N.D.A., N.D.D. T. W. WILLIAMSON, B.Sc., N.D.D. E. A. G. WIGGINS, N.D.A., N.D.D.
Principal of Farm Institute	J. M. TEMPLETON, B.Sc.
Lecturer in Agriculture and Warden	O. ANDERSON, M.Sc.
Instructor in Horticulture	C. J. GLEED, N.D.H., F.R.H.S.
Assistant Instructors in Horticulture	A. P. KING W. C. IBBETT, N.D.H.*
Instructor in Bee-Keeping	H. P. YOUNG, Hon. Cert. B.B.K.A.†
Dairying Superintendent	Miss K. BOYES, N.D.D., N.D.P., B.D.F.D.
Instructress in Dairying	Miss M. DAVIES-COOKE, N.D.D., B.D.F.D.
Travelling Dairy School Instructress	Miss M. F. GRIFFITHS, N.D.D., B.D.F.D.
Instructor in Poultry-keeping	A. W. GRIMES, N.D.P.
Assistant Instructress in Poultry-keeping	Miss D. O. WINFIELD
Manager of Egg Laying Trials	W. INGLIS
Instructor in Farm Book-keeping	W. R. CARTER
Instructor in Farm Carpentry	Vacant
Instructor in Veterinary Hygiene	J. B. TUTT, F.R.C.V.S.†
Matron	Miss G. PRINCE

Herefordshire

Agricultural Organizer	J. L. EVANS, B.Sc.
Instructor in Horticulture	C. SAVIDGE
Instructress in Dairying	Miss O. JENKINS, N.D.D.*
Instructress in Poultry-keeping	Miss W. C. DAVIES, N.D.P.
Instructors in Hedging	J. JONES† W. MASON† T. DAVIES† H. GWILLIM†
Instructor in Bee-keeping	J. ARNFIELD†
Instructor in Veterinary Hygiene	R. WOOFF, M.R.C.V.S.†
Manager of Egg Laying Trials	S. F. SIDERFIN*

Hertfordshire

Hertfordshire Agricultural Institute Staff

Principal and Agricultural Organizer	J. Hunter-Smith, B.Sc., N.D.A., N.D.D.
Vice-Principal and Instructor in Horticulture	C. E. HUDSON, N.D.H., F.R.H.S.*
Lecturer in Agriculture	R. G. FERGUSON, M.Agr.
Lecturer in Agriculture and Farm Costings	J. W. REID, N.D.A., F.A.C.
Agricultural Chemist	H. W. GARDNER, B.A., Dip.Agric.

Assistant Instructors in Horticulture	E. R. SALTMARSH, N.D.H., C.D.H.* L. F. CLIFT, N.D.H., C.D.H.*
Instructor in Poultry-keeping	D. W. FERGUSON, N.D.P.
Instructress in Dairying	Miss D. M. Peacock, N.D.D.
Instructor in Book-keeping	A. DEAN
Manageress of Egg Laying Trials	Miss E. M. CHAMBERS
Instructors in Farriery	J. HEALY, M.R.C.V.S.† W. WALKER, A.F.C.L.† B. B. BENNETTO, F.W.C.F.†
Instructor in Veterinary Hygiene	G. ELMES, F.R.C.V.S.†
Instructor in Bee-keeping	J. HERROD-HEMPSALL, F.E.S.†
Matron	Miss J. JONES
Farm Foreman and Instructor in Manual Processes	R. O. MILLAR

Huntingdonshire

Horticultural Adviser	F. TUNNINGTON

Isle of Ely

Horticultural Superintendent	W. F. CHEAL, N.D.A., D.I.C.

Isle of Wight

Agricultural Organizer	B. JENKINS, M.Sc.
Instructor in Horticulture	C. MARTIN, F.R.H.S.
Instructress in Dairying	Miss E. H. GIFFORD‡

Isles of Scilly

Horticultural Adviser	G. W. GIBSON, F.L.S.

Kent

Agricultural Organizer	G. H. GARRAD, N.D.A.
Agricultural Assistants	J. N. SHARROCK, N.D.A., N.D.D. S. J. TRAVERS, M.B.E., N.D.A., P.A.S.I.
Principal of Borden Farm Institute	T. W. MCDOUGALL-PORTER, M.C., N.D.A.
Lecturer in Agriculture (Institute)	E. A. BARTLETT, N.D.A.
Horticultural Superintendent	W. G. KENT, N.D.H.
Instructor in Commercial Fruit-growing and Market Gardening (Institute)	R. HART, N.D.H., N.D.A., N.D.D.
Instructor in Glasshouse Work and Market Gardening	W. CORBETT
Instructors in Cottage Gardening	H. C. ELSDON, N.D.H.* G. ANDREWS †
Instructor in Bee-keeping	G. W. JUDGE†
Instructor in Poultry-keeping	W. R. SNELL
Assistant Instructor in Poultry-keeping	L. C. TURNILL
Instructor in Farriery	W. WARDLEY, R.S.S.†

(To be continued)

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NOTES FOR THE MONTH

Government Agricultural Policy

In reply to questions by Sir Douglas Newton, M.P., and Lieut.-Colonel A. P. Heneage, M.P., the following statement regarding Government agricultural policy was made by Sir John Gilmour, the Minister of Agriculture and Fisheries, in the House of Commons on Thursday, February 11, 1932 :—

At the present time practically the whole of agriculture, like the whole of industry, is suffering from the effects of the general fall of commodity prices which has been experienced with such severity since the autumn of 1929.

The branch of agriculture which has suffered most from the fall in prices is wheat growing, and the Government propose to assist growers of this crop by means of a quota scheme which will provide them with a guaranteed market and an enhanced price for wheat of millable quality. Full details of this scheme will be available to the House shortly when the Bill dealing with the matter is introduced.

The Government attach great importance to a long-range policy, but immediate action is necessary, and accordingly, with the exception of wheat, wool, and meat, all agricultural and horticultural produce will be included within the scope of the Import Duties Bill.

Under that Bill all foreign agricultural and horticultural products, with the exception of a few items and of produce already chargeable with a Customs Duty, will be subject to the general tariff of 10 per cent. *ad valorem*, or its equivalent in specific duties. An additional Customs Duty may be imposed on any particular product if recommended by the Import Duties Advisory Committee provided for in this Bill, and in this connexion malting barley and certain horticultural products will receive particular attention.

The administrative feasibility of levying an additional Customs Duty on malting barley is being examined with a view to this question being referred to the Import Duties Advisory Committee at the earliest possible date if a practicable

scheme for differentiating at the port between malting barley and feeding barley can be evolved. The alternative method of a quota is also under consideration.

The Import Duties Advisory Committee will also be asked to recommend what duties should be imposed on the commodities at present covered by the Horticultural Products (Emergency Customs Duties) Act, 1931, when duties under that Act expire.

The foregoing proposals refer to immediate action. The Government's long-range policy is designed to facilitate economic development in those branches of the agricultural industry which are likely to be the most remunerative, and particularly those which lend themselves to most rapid development.

With regard to milk and milk products the Government aim particularly at the improvement of marketing, and have decided to set up a Reorganization Commission under the Agricultural Marketing Act, 1931, with a view to the formulation of schemes. A corresponding scheme for the organization of the milk industry in Scotland is already in an advanced stage of preparation. They will also investigate the means of securing a reduction of disease among dairy herds. Imports of milk and milk products are being dealt with under the Import Duties Bill.

With regard to bacon the preparation of a scheme for the organization of the bacon industry will be undertaken forthwith, and, provided a feasible and satisfactory scheme is evolved, the Government will be prepared to promote some form of quantitative regulation of imports.

The Government also undertake to appoint a Reorganization Commission, if desired by potato growers, with instructions to prepare a scheme for the organization and marketing of the home potato crop and to consider such practicable complementary action as may appear to be necessary for the regulation of imports of main crop potatoes.

The Government also intend, as far as financial circumstances permit, to maintain and develop agricultural education and research and the policy of land settlement. The Government attach great importance to the better grading and identification of home-grown food supplies, including, where practicable, the extension of the National Mark movement.

While the Government do not propose to make any change in the present system of regulating agricultural wages they are fully alive to the necessity of securing observance of the

Orders made under the Agricultural Wages (Regulation) Act, and they wish to call the attention of agricultural workers to the facilities which exist for the investigation by the Ministry of Agriculture and Fisheries of complaints that the requirements of these Orders are not being observed.

Immediate help to the fishing industry will be afforded by the Customs Duties proposed in the Import Duties Bill. Further action which may be necessary in connexion with the fishing industry will be taken after full consideration has been given to the Report of the Economic Advisory Council on the Fishing Industry which has just been presented to Parliament.

Obviously the future of any industry must depend largely on its own efforts to adapt its methods of production and marketing to modern conditions, and it is believed that the Government's policy will do much to restore confidence and stimulate endeavour in the two great industries of agriculture and fisheries, which play so important a part in the economic life of the nation. It is the earnest desire of the Government to secure the good will of all those whose co-operation is necessary to effect improvements both in the production and distribution of our home-grown food supplies.

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Minister's Address to the Central Chamber of Agriculture

AT a specially-convened meeting of the Central Chamber of Agriculture on February 18, the Minister of Agriculture and Fisheries, Sir John Gilmour, further explained the Government's agricultural policy. He said that the Government had come to the conclusion that the arable areas constituted the most urgent problem and, for that reason, the wheat quota had been placed in the forefront of their policy. Although various difficulties had arisen, he was glad to say that, after consultation with the interests involved, an agreed scheme had been arrived at, so far as machinery was concerned, and to give effect to the scheme he was introducing a Bill into Parliament. Regard for the difficult circumstances in which the arable farmer was working was only one side of the Government policy, but, although the wheat quota dealt with only part of the problem, it had its reflections on many other parts of the industry.

There was, also, the immediate part of the policy contained in the Import Duties Bill; and he hoped that the agricultural community would realize that, through this, agriculture was for

the first time placed on an equal status with industry, and that the Government had made clear that they desired to give assistance as rapidly as possible. If their plans were carried out, the duties under the Import Duties Bill would come into operation on March 1.

He wished to emphasize that, with the exception of meat and wheat, all agricultural produce was treated in the Act on a broad general principle. There was the 10 per cent. revenue tariff for which there was a very urgent necessity, and he would remind those who were pressing for additions to the free list that, whatever arguments might be adduced for this or that exception, every exemption reduced the possibility of revenue and, therefore, of relief from the burden of direct taxation that pressed as heavily on the agricultural industry as on others. At the present time, the free list included cotton-seed and linseed, which were the basis of the most extensively-used feeding stuffs. They had deliberately excluded imported manufactured cake from the free list, as the Government desired, above all things, to encourage the manufacture of goods in this country where it could be known with certainty that the quality and circumstances of production were good. On the other hand, if it was found later that the home manufacturing industries were treating agriculturists unfairly in the matter of commodities, such as cake, it would be open to agriculturists to make out their case, and foreign cake would, if necessary, be added to the free list. He did not think, however, that such a course would become necessary.

As the Bill was at present drafted, the Commissioners could recommend the Government to make additions to the free list, but there was no power to take from the list. The Chancellor of the Exchequer had intimated, however, that he was prepared to consider a proposal that power should be given to take out of the free list.

Dealing with the long-term policy of the Government, the Minister said that there were people who criticized the methods of production, whether in agriculture or other industries, without sufficient regard to circumstances and without a close, intimate knowledge of the industry concerned. Agriculture, like other industries, could show a large proportion of high efficiency, but anyone who had studied the subject must admit that, with the progress of time, changes of objective and advances in method could be made with advantage to the industry. For the first time in our history, the agricultural community had been given an opportunity to share in a great

national scheme; and it behoved the industry to take stock of circumstances and methods and see how far the farmers could co-operate in improving them.

The Government, for example, asked that the pig producers should co-operate in devising a scheme which would, of necessity, entail some measure of control, and they must not blink that fact. While not enamoured of undue State interference in any industry, he was conscious that they had certain treaty obligations of great moment to this country, and, in order to meet those treaty obligations, some measure of control and co-operation on the part of the industry was essential if any action were to be taken with regard to regulation of imports. If such an arrangement were reached, the Government definitely pledged themselves to give the benefit of some form of quantitative regulation of imports of all pig products.

As to the milk industry, could anyone say that it was well organized or satisfactory from the farmers' and producers' point of view? The Government were anxious to help in this matter, but the industry must also assist. Quite frankly, if the Government were to give assistance, they must, in return, be assured of efficiency and of a certainty that the products of the industry would be available for the cities and the people. Again, in dealing with the problem of potatoes, it was essential that there should be some measure of organization, and in this matter also the Government looked for the co-operation of the industry.

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The Home Wheat Quota Scheme

THE Government plan for applying the principle of a quota in favour of home-grown wheat is contained in the Wheat Bill introduced into the House of Commons on February 23. The Bill is intended to provide wheat growers in the United Kingdom with a secure market and an enhanced price for home-grown wheat of millable quality, without a subsidy from the Exchequer and without encouraging the extension of wheat cultivation to land unsuitable for the crop. The benefits of the Bill are to be available in respect of wheat harvested in 1932 and subsequent years.

There is no section of farmers in the United Kingdom that has suffered so severely from the "economic blizzard" of recent years as the growers of wheat. For several years the world's wheat supplies have been much greater than the effective world demand for wheat. Bread consumers in this

country have the cheapest loaf in the world owing to the sale in our markets, at prices much below the cost of production and delivery, of the wheat surpluses of exporting countries. There is the danger, however, that in the struggle for a market for wheat, our own wheat-growing industry may be seriously crippled. That would be a disaster for wheat growers, and it would disturb the balance of home agriculture as a whole.

Owing to the slump in world wheat prices, the area of wheat in the United Kingdom has fallen, since 1927, by more than 450,000 acres, to 1,250,000 acres in 1931, a figure which is the lowest recorded since statistics were first collected in 1866. The decline of the wheat area has been accompanied by a large reduction of the area under the plough and of the number of workers employed on the land, and in severe losses to farmers generally in the districts concerned.

The Wheat Bill contains no proposals that interfere with the free importation of wheat into the United Kingdom. The consumer of bread and also the poultry-keeper will continue to benefit from cheap supplies of imported wheat. Flour millers and flour importers will, however, be required to make quota payments into a Wheat Fund in respect of every hundredweight of flour delivered by them in the United Kingdom. These payments will be calculated by reference to the proportion (or quota) of their deliveries of flour in any year represented by the amount of the "anticipated supply" for that year of home-grown millable wheat.

Millers will not be required to mill home-grown wheat in every parcel of flour that they manufacture; they will be left free to buy such wheats as they desire for the various brands and types of flour that they mill. Apart from the requirements to make quota payments, flour millers and importers will be free to carry on their business as at present, subject to one obligation, referred to later, which affects millers only.

The "Wheat Fund" will be controlled by a Wheat Commission constituted under the Act and appointed by the Minister. From this Fund, "deficiency payments" will be made to registered wheat growers on the basis of their certified sales of home-grown millable wheat. These payments will represent (subject to a deduction for the administrative expenses of the Commission) the *difference* between the *average* market price of home-grown millable wheat, as ascertained at the end of each cereal year, and a *standard* price, stated in the Bill, of 10*s.* per cwt. (equivalent to 45*s.*

per customary quarter of 504 lb.). Wheat growers will continue to receive from buyers of their wheat on a free market the actual sale price, whether higher or lower than the ascertained average for the year.

As a safeguard to the Wheat Fund each year, the Bill limits the quantity of home-grown millable wheat for which "deficiency payments" in any cereal year may be paid by requiring the Minister to prescribe, for each cereal year, the quantity of home-grown millable wheat which he anticipates will be sold by growers in that year; if the quantity actually sold exceeds the anticipated supply, the "deficiency payments" to be made to growers will be reduced proportionately.

In order to check the extension of wheat growing to land unsuitable for the crop, and as a safeguard for the consumer of flour, the quantity prescribed as the anticipated supply may not exceed, in any cereal year, 27,000,000 cwt. (equivalent to 6,000,000 quarters of 504 lb.), the estimated yield of 1,500,000 acres without allowing for seed and unmillable wheat. This provision limits the amount which would be available in the Wheat Fund in any year. Hence, the effect of a supply above the maximum, while not depriving any individual grower of participation in the fund, would reduce the amount of the deficiency payment per hundredweight made to all growers.

The amount of the quota payments by millers and importers of flour will be greatest when the world price of wheat is lowest, that is to say, when the loaf in the United Kingdom will be at its cheapest. On the other hand, if world wheat prices tend to become higher, the quota payment will be lower, and the assistance under the Bill to wheat growers will be reduced.

The Bill provides for a review and (if necessary) revision of the standard price of 10*s.* per cwt. (45*s.* per quarter) in three years' time in the light of conditions then prevailing.

The securing of a certain market for home-grown wheat of millable quality is provided by a clause of the Bill which imposes upon flour millers an obligation to buy unsold stocks of wheat from wheat growers during the months of June and July. The obligation is subject to the provision limiting its operation to not more than 12½ per cent. of the anticipated supply of home-grown millable wheat for that year, and for this purpose the maximum of 27,000,000 cwt. (6,000,000 quarters) does not apply.

The machinery for operating the scheme has been worked out by the Ministry of Agriculture and Fisheries with repre-

sentatives of the farmers, millers, importers, and corn merchants, who have also been consulted in the drafting of the Bill. The Bill, which is presented by Sir John Gilmour, Minister of Agriculture and Fisheries, is also backed by the Prime Minister, the Lord President of the Council and the Secretary of State for Scotland.

No charge upon the Exchequer or local rates will be created by the Bill.

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Rothamsted Conference on Power Farming*

THE following note has been furnished by Mr. H. G. Miller, of the Rothamsted Experimental Station :—

"Whither Agriculture ?" is a question very much to the fore at the present time. A Conference on "Mechanization and British Agriculture," held on February 9 at Rothamsted, under the chairmanship of the Earl of Radnor, dealt with what is probably the most important aspect of this question, and drew the biggest attendance yet seen at the Rothamsted Conferences. This Conference was unique in the Rothamsted series : in the past these Conferences have dealt with actual facts, practices and experiences ; this one dealt largely with speculation and prophecy. Every now and again speakers seemed to realize that they were slipping away from realities, but often it proved only too easy to slip away again. This is no adverse criticism. "Where there is no vision, the people perish," and this whole subject is one in which clear vision and imagination are essential. The practical farmer will soon sort out the practicable from the impracticable : indeed, he is already doing the sorting.

As Lord Radnor pointed out, "Mechanization" is a bad term ; but it has the advantage of being well understood because of its recent frequent use. It means much more than mere mechanized corn-growing, for it includes "specialization." A new term is wanted to cover the phrase "New Methods of Reducing Costs of Production," which defines the scope of the Conference.

There were three excellent papers : "The Maintenance of Soil Fertility under Mechanized Farming Systems," by Sir John Russell ; "Engineering Developments and Possibilities," by Mr. J. E. Newman ; and "The Combination of Livestock with Systems of Mechanized Farming," by Prof. J. A. S. Watson. The discussion, equally good, was opened

* See also the note on the Winchester Conference on power farming : this JOURNAL, January, 1932, p. 980.

by Mr. G. H. Nevile in the morning, and by Viscount Lymington in the afternoon, being continued by Mr. C. S. Orwin, Mr. G. A. Tucker, Mr. J. A. Brown, Mr. E. D. Wolton, Mr. Dudley, Sir Robert Greig and Dr. Keen. It was not particularly critical, and in the short time available several doubtful statements were allowed to pass unchallenged.

Sir John Russell showed what light was thrown by work at Rothamsted and Woburn on the two chief questions put to the chemist by pioneers of change to-day: "Can we farm without dung?" and "What are we to do with our straw?" Over a long period of years, complete artificials have given us as good yields as dung on our wheat and barley plots. Specialized corn-growing also has been successfully practised commercially in certain cases for many years, artificials being used instead of dung. All the evidence showed that for corn-growing and for grass artificials alone could keep up the fertility on practically all soils. Mr. Brown agreed with this, and emphasized the importance of really thorough cultivation. Mr. Nevile and Prof. Watson, on the other hand, thought a great deal depended on the nature of the soil, since light soils need something more than artificials to keep them really fertile.

Organic matter levelled out the year-to-year fluctuations, Sir John continued, the effect being most marked on light land. When it came to root and potato growing, however, it was impossible on most soils to obtain the highest yields without dung or an efficient substitute. Artificials alone on the Rothamsted soil—a sticky clay with flints—could not generally push the yield of swedes above 18 tons or of mangolds above 25 tons.

Turning next to the utilization of straw, where it was not wanted for litter, Sir John said there were three possibilities, apart from actually selling it or burning it: it could be ploughed in alone, ploughed in along with artificials, or rotted down by the Adco process. In dealing with this question it was impossible to be very definite, because our experiments dealing with the first two possibilities had been running for only a few years. So far we had had but little success with straight ploughing in, a process which Prof. Watson and many farmers present thought terribly wasteful. Mr. Nevile, however, believed in it, and suggested that our stiff, retentive soil masked the benefits obtained from it. He liked to plough in straw for its power of retaining moisture on his light soil. Our experience of ploughing in straw at Woburn is insufficient

to justify further comment, but it is certain that straw ploughed in *shortly* before sowing the next crop depresses the yield.

The Adco process is perfectly workable, but, as Mr. Nevile observed, the great difficulty is the need for so much water. The rotting of straw in the ground, therefore, by mixing artificials with it, seemed to have possibilities.

Sir John Russell next dealt with green-manuring. Sometimes it was successful, often it was a failure. Dr. E. M. Crowther had now discovered one of the chief reasons for these discrepancies, the question of timing. The green crop must have time to decompose and produce nitrates, but the following crop had to be in the right stage to utilize these nitrates and so prevent their being washed out.

Lastly, Sir John emphasized the striking results obtained from fallowing, which was rendered once again economically practicable with power cultivation. The reasons for these results, and for the at-present-inimitable effects of sheep-treading on light land, were not yet understood.

The larger part of Mr. Newman's paper dealt with the present position of tractor design and development, with special reference to wheels and tracks, and with mechanized corn-growing. It was well filled with facts and figures obtained from several pioneers of power-farming in this country and from American sources. Mr. Newman desired large-scale operations, involving implements of increased size, with consequent large labour economies. As Prof. Watson said, mechanization could effect its object only if there was a really big economy of labour. Mr. Nevile disliked over-emphasizing the need for large and new implements during the transitional stage, because of the farmer's shortage of cash and the range of his present equipment. He preferred to adapt what he had as far as possible, and effect the change-over gradually. There is also the possibility in the meantime of new ideas in implement design, as Dr. Keen suggested, thinking of the development of rotary cultivation. Further, increased speed of cultivation resulted in only a slight increase in draught—a point worthy of more attention from implement makers. In any event, very big implements would not generally be suitable in this country unless we enlarged our fields. Mr. Nevile was against this, at least for the present; the size of our fields did not really increase our total costs of production very much, and the present divisions made them suitable for grazing stock on temporary leys.

Continuing, Mr. Newman thought that the combine-harvester

we should find most suitable for our conditions might be of quite new design. It had to deal with heavy crops; a narrower cutter-bar, with wider canvases, was to be preferred. A drier was essential here, and had the additional advantage, according to Mr. Dudley, of bringing indifferent samples up to top quality. Considering all the implements necessary, £1,500-£2,500 would equip farms ranging from 330 to 1,200 acres. Present exchange rates discourage mechanization. Mr. Nevile suggested that one could adapt existing equipment for less, finding the cash by cutting out live stock purchases.

In conclusion, Mr. Newman dealt with mechanization for growing roots and row crops, and emphasized the value of old motor cars for much farm work.

In addition to the points already mentioned, Mr. Nevile dealt with suitable cropping systems and probable costs, also with the drawback to combine-harvesting when weeds and young grass were present in the corn crop, but thought it unnecessary to windrow the crop before combining. Mr. Tucker disagreed.

Prof. Watson began by emphasizing that nearly 70 per cent. of our agricultural output was from livestock. For long, arable farming and stock feeding had been closely linked. Was it really necessary that mechanization should cause so complete a break with tradition? Root growing was the chief difficulty, but developments with kale supplemented with silage might go far to solve this problem. The expense of handling dung was also important, but could this not be mechanized to a much greater extent than at present? The North Country system of folding fattening tegs could also be fitted into mechanized systems.

Finally, Prof. Watson outlined an alternative to the stockless mechanized farm. Essentially, 600 acres (with, possibly, extra grass) would be split into five breaks—two corn crops, two-years' ley, and in the fifth break a combination of rape, kale, silage and fallow. This suggestion deserves careful consideration, and it was unfortunate that lack of time prevented any comments on it. Viscount Lymington, however, after discussing the national effects of mechanization, and denouncing in no uncertain terms the adoption of prairie methods in this country, developed the stock idea further. He wanted to mechanize the arable side of the farm and employ the displaced labour in a much more intensive live stock enterprise, the arable providing much of the stock food. He also referred to the development of drying young green crops, but figures

—and possibly experiments—are necessary to support his assertion that the unripe cereal crop provides more stock food when unripe than when carried through to harvest. It cannot be cut green with success more than once. Extra cultivations, more seed and other expenses are thus incurred if the land is to be kept under crop.

Mr. Orwin emphasized the need for a new outlook. We must not try to patch old ideas with new methods. We must exploit our climate and natural advantages to the full. There is room for still further emphasis of Mr. Orwin's views.

The word "electricity" was mentioned, it is believed, only once during the whole Conference!

The report of the Conference will be obtainable shortly from the Secretary, Rothamsted Experimental Station, price 1*s.* 6*d.*

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Feeding of Dairy Cows

THE main item in the cost of milk production is undoubtedly the cost of food. It is generally accepted that during the winter months this one item represents as much as 70 per cent. of the total, and even in the summer it covers at least 50 per cent. Any method, therefore, that tends to combine efficient feeding and maximum production with minimum costs is of the utmost importance and must command the careful attention of the dairy farmer.

The Ministry has recently issued a comprehensive Bulletin* on this subject, prepared by Mr. James Mackintosh of the National Institute for Research in Dairying at Reading. It has, of course, not been possible to prescribe definite sets of rations applicable to all the varying conditions throughout the country, but, in Part I of this publication, the principles underlying feeding, both for maintenance and milk production, have been set out and analysed in such a way that the farmer may have at his disposal the knowledge necessary for the design of rations on an efficient and economic basis.

Part II is a survey of the many varied feeding stuffs and feeding requirements in their particular relation to milk production. This section deals with such questions as winter feeding, rations for dry in-calf cows, rations for cows in milk, home-grown foods, concentrates, control of quantities and

* Bulletin No. 42, *The Feeding of Dairy Cows*, obtainable through any bookseller, or from H.M. Stationery Office, price 9*d.* (11*d.* post free).

other matters. With the help of this section and the various Tables and the Ration Ready Reckoner provided, the dairy farmer should, under normal conditions, be able to select a ration for immediate use.

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Wild White Clover

THE value of wild white clover in permanent pastures and long leys is, of course, generally known. Most farmers express a first preference for English seed from "old pastures" and a second preference for "once-grown" old pasture seed. In order to encourage the production of seed of these two types and to help farmer-buyers to make sure that they are getting the genuine article, a certification scheme was brought into operation two years ago by the National Farmers' Union and the Ministry of Agriculture and Fisheries jointly.

The broad idea is that fields capable of producing "old pasture" or "once-grown" seed should be "recorded"; and that each time a seed crop is taken from one of these fields a certificate should be issued in respect of it. The certificate should help the producer to sell his seed and, at the same time, should afford a measure of security to the purchaser.

The weather conditions of 1930 and 1931 were most unfavourable for the launching of the scheme, but in spite of that a good deal of preliminary work has been put in. Although very few certificates have been issued so far, well over 5,000 acres have been "recorded" as capable of producing certified seed.

The scheme is administered by the Central Wild White Clover Committee of the National Farmers' Union (with headquarters at 45, Bedford Square, London, W.C.1) assisted by a number of County Committees.

Any grower of wild white clover seed who wishes to take advantage of the scheme (whether he is a member of the National Farmers' Union or not) should write at once to the County Branch of the Union asking for details and the necessary form of application. The matter ought not to be left over until a grower intends taking a seed crop, because a "growing-on" test of a sample from each field has to be made before the field can be recorded, and this takes a season. Applications for inspection to be made this summer should be in the hands of the County Committee not later than April 15.

Mole Draining Demonstrations, 1932

THE second of this year's mole draining demonstrations was carried out on January 27 and 28 at the farm of Mr. Ben Burgess, Howe Hall, Norwich. The implements and tractors used were the ones previously demonstrated at Chesterfield,* with the addition of a Caterpillar "Fifteen" tractor. During the two days drains were made in six fields, covering about forty-five acres of land, at an average depth of 14½ in. Work at greater depth, however, was carried out in certain places where the state of the ground allowed the tractors better adhesion.

In order that the tractors might work without hindrance, the main drain across the two wettest fields was dug out by hand and piped after the subsidiary drains had been pulled. In the other fields the main drains were drawn as required by a cable outfit, the general depth of the drains being about 21 in. to the bottom of the mole.

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Soils Correlation Committee

THE Soils Correlation Committee was set up by the Ministry of Agriculture and Fisheries for England and Wales and the Department of Agriculture for Scotland, as a result of a request from members of the Soil Survey Field Meeting at Bangor in 1929; the terms of reference of the Committee were "to correlate soil series now being examined and classified by soil surveyors in different parts of the country." During the spring of 1931, the Committee made a tour of England and Wales to examine the work that had been done by local surveyors. The tour occupied some six weeks, and the results of these investigations are discussed in the First Report of the Committee, issued on December 7, 1931. In addition to the main report there are twelve Appendices covering each of the advisory provinces in England and Wales, and containing the topographical and analytical data relating to the different series and their profiles. A few copies of this Report are available for interested people; applications should be addressed to the Secretary, Mr. G. E. Fussell, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

* See this JOURNAL, February, 1932, p. 1093.

RECENT RESEARCH IN FOOT-AND-MOUTH DISEASE

J. A. ARKWRIGHT, F.R.S.,
Chairman, Foot-and-Mouth Disease Research Committee.

[*This article may be regarded as a brief summary of recent research as outlined in the Fourth Progress Report of the Foot-and-Mouth Disease Research Committee, including references to work described in earlier Reports.**]

THE existing Committee for Research on Foot-and-Mouth Disease was appointed by the Minister of Agriculture and Fisheries in March, 1924, and it has issued four Reports.

When the work of the Committee began, certain fundamental problems regarding the disease were still unsettled, since effective research on the subject had only been carried on at a few centres abroad, and in several instances the conclusions of different workers had been contradictory.

A great advance was made in the methods of investigating the disease when, in 1921, Waldmann and Pape, working at the isolation station for foot-and-mouth disease research on the Island of Riems in Germany, made the valuable discovery that guinea-pigs could be infected with foot-and-mouth disease regularly if the virus was inoculated on the under surface of the foot, *i.e.*, the plantar pad. A minute inoculation at this spot reproduces the disease which manifests itself by vesicles at the site of the inoculation and on the tongue, lips and other feet, as in cattle. This discovery made research into the disease very much easier and less expensive, since the inoculation of guinea-pigs can now be used to detect the presence of active virus and to estimate its strength.

Up to this time the suggestion that guinea-pigs, rats and other small animals might contract foot-and-mouth disease was regarded as very unlikely, since many unsuccessful attempts had been made to infect them experimentally. There are great inherent difficulties in working with farm animals that are costly to buy, to feed and to look after, and that need a large space. All experiments, therefore, that can be performed on such animals as the guinea-pig, are best carried out on them.

The Virus of Foot-and-Mouth Disease was the first infective agent of the kind to be recognized. Loeffler and Frosch made the discovery in 1892 that the serous fluid or lymph

* See page xiii of this issue.

taken from a vesicle on the tongue of a calf could be diluted 40 times with water and passed through a Berkefeld filter that kept back all ordinary bacteria, and that the resulting liquid was infective for a calf in a dose of one cubic centimetre (about 20 drops), injected into a vein, and further that lymph might be diluted 5,000 to 20,000 times and still produce the disease in calves. The particles of this virus are so small that they will not only pass through finer filters than those of almost every other virus, but are quite invisible with the highest powers of the microscope.

Like most other viruses that of foot-and-mouth disease cannot be cultivated on artificial culture media as can ordinary bacteria. The exact strength and activity of a sample of virus can be estimated by inoculating guinea-pigs with different dilutions of the virus and determining the highest dilution with which infection can be obtained. A good sample of vesicle fluid will still infect a guinea-pig after it has been diluted with water 500,000 or 5,000,000 times. By estimating the strength in this way the survival or rate of destruction of the virus under different conditions can be accurately measured. Experiments have shown that the virus in vesicle fluid or blood, even when diluted, will withstand rapid drying and if kept chemically dry may remain active for as long as two years. Exposed to the air and allowed to dry, the virus does not, as a rule, remain infective very many days. If vesicle fluid is dried in this way in the open air on blotting paper or wooden articles, the survival does not exceed one or two weeks, but on some substances (such as leather), and especially on certain articles of fodder (such as hay and bran), active virus has been found to persist for a very much longer time at ordinary temperatures.

At a temperature of 122° to 140° F., the virus is killed in a few minutes and sunlight is also very destructive.

Disinfectants.—Experiments with disinfectant liquids under conditions as far as possible like those met with in practice show that carbolic and cresylic acids and similar materials are less powerful against the virus than against most bacteria. A 4 per cent. solution of common washing soda in water was found to be the most practical disinfectant. A solution in hot water at 140° F. can be used effectively for washing butchers' utensils and for scrubbing tables and floors of slaughterhouses. A 1 per cent. solution of caustic soda is also a very useful disinfectant and is much used in Germany. The disinfection of hides requires special care since many disinfectants spoil

the leather. Immersion in a solution of 1 part bi-sulphate of sodium in 10,000 of water for five hours or of 1 of sodium fluoride in 20,000 of water for two hours killed the virus and did not damage the hide.

Distribution of the Virus in the Animal Body.—When a cow has been inoculated with virus by scratching or by injecting a minute quantity into the thickness of the mucous membrane of the lip or tongue, a period of incubation follows, usually lasting three or four days. A vesicle then appears at the site of inoculation and one or two days later secondary vesicles also break out in the mouth and on the feet. In guinea-pigs, the incubation is usually only 24 hours after inoculation on the sole of the foot. The distribution of the virus in the body of an infected animal has been carefully studied. It has been found that, in cattle, the time between infection and the presence of the virus in the blood is usually three to five days, but in the guinea-pig only one or two days; but the maximum infectivity of the blood is usually reached about the time when secondary vesicles first appear, or shortly before, and then it rapidly decreases, until after the full outbreak on the feet and mouth the blood has almost ceased to be infective. The skin or mucous membrane at the sites of the vesicles has been found to retain active virus longest, but even here it can seldom be detected for more than 10 days in cattle, or a week in the guinea-pig, from the onset of the disease. During the first few days the milk and urine are usually infected, like the blood, and the virus is also present in the internal organs and bone-marrow, but disappears from them also when it leaves the blood.

Persistent Infectivity of the Live Animal.—Some observers maintain that cattle that have passed through an attack do not all rid themselves of the virus so readily, but that a very few remain infectious for months. Whether such persistent "carriers" of the virus really occur is not yet finally settled.

Duration of Infectivity of the Carcass.—Although during life an animal usually rids itself of the virus rapidly and completely, if it is killed at the height of the disease the carcass may remain infectious for a very long time. Direct experiments have shown that carcasses of cattle killed and dressed by trade methods remain infective when kept frozen or chilled for long periods.

Effect of Storage at Different Temperatures on the Infectivity of Carcasses.—In view of the importance of the persistence of

infectivity in stored carcasses, experiments have been made on the carcasses of cattle and guinea-pigs. The virus was recovered from the bone-marrow of carcasses of guinea-pigs killed at the height of the disease after the carcasses had been kept for 13 days at 64° F. and had become partly putrid. Other experiments have shown that the virus usually remains active for very much longer periods when carcasses are kept at "chilling" or freezing temperatures. It is known that freezing and thawing has the effect of killing some bacteria, but it has been found that repeated freezing and thawing has little or no effect in lessening the activity of the virus. In order to test more exactly the conditions under which carcasses are kept when stored for trade purposes, cattle were allowed to acquire infection by contact with other animals and were slaughtered by a butcher at the stage of the disease which was believed to be the most infective. The results of experiments made with 10 cattle (*Fourth Progress Report*, p. 40) show that if animals at a highly infective stage of foot-and-mouth disease are killed, dressed and stored at a "chilling" or freezing temperature they may remain infective for some weeks.

Resistance of the Virus to Pickling.—Not only does the virus survive in the carcass kept in the refrigerator, but it has been found (*Second Prog. Rept.*, p. 41) that parts of a carcass may still be infective after preservation in pickling solutions of salt, etc. Virus in the feet of infected guinea-pigs remained active in different pickling solutions for periods up to 35 and 49 days.

Milk.—The use of the milk of infected cows is believed to be a common means of spreading the disease on the Continent, since, if it is not heated, milk may infect calves or pigs fed on it. The time during which virus will survive in milk depends on the circumstances, and especially on the temperature. The virus is soon killed when the milk becomes sour (*Fourth Prog. Rept.*, p. 248).

Dried Milk.—Milk powder is usually made by drying on a heated roller or by spraying milk into a dry and heated chamber. Experiments suggest that the virus may not be killed by the spraying method if the milk has not previously been sterilized by heat; but that drying on heated rollers is much more likely to do so.

Types of Virus.—One attack of foot-and-mouth disease generally protects an animal against further attacks for at

least one or two years. Practical experience on the Continent has shown that cattle occasionally have two or more attacks of the disease within a few months and this has been explained by the discovery in 1922 that there is more than one type of virus. Each type causes an attack of foot-and-mouth disease, but the attacks due to two distinct types of virus do not protect the one against the other. Three distinct types are known, O and A described by Vallée, and C by Waldmann, and there is evidence that others exist. The three known types of virus produce similar attacks of disease. The only way of discovering the type to which a newly-acquired strain belongs is by inoculating with it animals immune to known types of virus in order to see whether they are susceptible to the new strain. In all, 40 strains have been examined from outbreaks in this country, and of these 37 conformed to the O type.

Foot-and-Mouth Disease in other Animals besides Cattle, Pigs, Sheep and Goats.—(1) *Man.*—The occurrence of foot-and-mouth disease in man has seldom been conclusively proved, but two undoubted accidental infections of laboratory workers have been recorded.

(2) *Rats.*—The infection of wild rats can be obtained by inoculation, and they can also be infected by feeding them with virus from guinea-pigs (*Second Prog. Rept.*, pp. 16, 103). Rats caught on a farm in Yorkshire, the site of a foot-and-mouth disease outbreak, were noticed to have suspicious sores and were sent to the Ministry's Laboratories at Pirbright for examination. Material from one of these rats was inoculated into a guinea-pig and produced definite foot-and-mouth disease. Virus was also obtained from a rat caught at the experimental station at Pirbright; from this, guinea-pigs, wild and albino rats and swine have been infected. Swine have also been infected by feeding them on the bodies of guinea-pigs inoculated with this strain of virus. The signs of infection in rats may be very slight, but include vesicles on the feet and toes, on the tongue and lips and on the tail. Altogether 132 rats have been caught at Pirbright and in the immediate vicinity of the compound, and six of these have been found to be infected.

(3) *Hedgehogs.*—Infection of hedgehogs has been repeatedly obtained by inoculating them with virus (*Second Prog. Rept.*, p. 51; *Fourth Prog. Rept.*, pp. 164, 167). After inoculation they usually became very ill and were killed or died in a week or ten days. Healthy hedgehogs kept in contact with those

recently inoculated also showed signs of severe infection. The virus recovered from hedgehogs was highly infective for guinea-pigs. The hedgehog is the only species of animal, besides farm animals, in which rapid spread of a severe form of the disease by contagion is known to occur, though it has also been found that transmission by contact may occur fairly often among rats in captivity.

(4) *Rabbits, Dogs and Cats* have all been infected in the laboratory, but scarcely anything is known of cases occurring naturally, and the disease has not been shown to spread readily among these animals (*Second Prog. Rept.*, pp. 50, 51; *Third Prog. Rept.*, pp. 71, 114; *Fourth Prog. Rept.*, pp. 164, 334, 341).

Virulence and Adaptation of the Virus.—(1) *Virulence.*—It is a common experience in infectious disease, whether due to bacteria or a virus, that the infective agent varies in activity at different times and in different conditions and epidemics. A strain of foot-and-mouth disease virus of low activity can often be restored to full virulence by rapid infection of one susceptible animal after another by direct transmission.

(2) *Adaptation.*—In attempted transmission of the disease from one kind of animal to another even a very active virus may fail to infect the new species. Such a virus may often be adapted to the new kind of host by the inoculation of two or more individuals in succession with very large doses. In some outbreaks among swine or sheep, foot-and-mouth disease does not readily spread to cattle and *vice versa*. In a similar way certain strains of virus from cattle have only been adapted to guinea-pigs with great difficulty, and repeated inoculations with some such strains have failed to infect the latter animals. Observations on adaptation show how dangerous it is to conclude without prolonged trial that a given species is not susceptible to the disease or is not infective for another species.

Artificial Production of Immunity.—Four methods have been used with several variations to produce specific resistance against foot-and-mouth disease. (1) The injection into animals of the blood-serum of inoculated cattle gives some protection for about 10 days. It has been found useful in the case of animals exposed to infection in markets, shows, etc., but the appearance of the disease may only be delayed. The serum is prepared by Waldmann at Riems, and is said to be "hyper-immune" and "polyvalent" because the cattle from which

it is taken have received several doses of each of the chief types of virus. An average of 200 cubic centimetres or about 6 oz. of serum is required to protect each adult bovine.

(2) Inoculation with active virus and at the same time with serum, so as to diminish the severity of the attack while not preventing it altogether, allows an animal to acquire the more lasting kind of resistance that usually follows an attack of the disease. By this means the disease may be rapidly passed through all the cattle in a herd, but in some cases the eruption of vesicles is delayed by the serum given. The period of quarantine imposed in Prussia is about five weeks after the inoculation. Since the cattle inoculated by this combined method are infective for a time for other animals, all the cattle in their immediate neighbourhood are given a protective dose of serum in order to prevent them from becoming infected and so spreading the disease. In Germany this method is called the "Ringimpfung," and is considered, especially in Prussia, to give very valuable results; but for various reasons the spread of disease and the renewed occurrence of outbreaks is not always prevented.

(3) Several methods of inoculation with attenuated virus have been used at different times, in imitation of the vaccination of man against smallpox, but no method of obtaining an attenuated virus that would be certain not to produce severe disease has yet been discovered.

(4) The inoculation of animals with virus that has been killed by treatment with formalin has been tried. A considerable degree of resistance can be regularly produced in this way, but it is necessary to use a very large amount of virus of the prevalent type and of high potency, and this it may be difficult to obtain. It is important that such a vaccine should be prepared by an exact method and that it should be thoroughly tested both for loss of infectivity and for its protective power on guinea-pigs before it is used on cattle (*Second Prog. Rept.*, p. 82; *Third Prog. Rept.*, p. 41; *Fourth Prog. Rept.*, pp. 153, 212).

Sources of Infection.—Evidence adduced from long experience on the reappearance of foot-and-mouth disease after slaughter and disinfection in England has recently been summarized. Out of 5,554 infected centres that have occurred in the course of the last 20 years, where re-stocking has taken place from 4 to 18 weeks after disinfection, the disease has reappeared in 57 centres, though in 13 of these the disease was

probably re-introduced. It has been pointed out that material taken experimentally from animals at the height of the disease retains infectivity as a rule much longer than the flakes of epithelium, etc., thrown off naturally by the animal during recovery. The recovered animal also usually becomes rapidly disinfected. It has been found that infection was much more persistent in cow byres in winter. It has been claimed that affected cattle and the stalls in which they had been confined often ceased to be infective for fresh animals 4 or 5 days after the onset of the disease. This has been confirmed at Pirbright at all seasons of the year under experimental conditions.

Observation and research during the last eight or ten years have indicated certain sources of infection that, in addition to the possible occurrence of "carriers," especially demand further attention and experiment. These sources of infection may be placed in three categories :—

(1) Foci of virus outside the animal body. The conditions needed for survival of the virus have been discussed in the Progress Reports and in the earlier pages of this summary.

(2) It has been shown that a wide range of animal species can be infected with foot-and-mouth disease. The transference of infection from one species to another does not always take place easily, and adaptation of the virus to the new species has sometimes to be acquired gradually before a well-marked infection occurs with regularity. The fact that rats are susceptible, and the discovery that the signs of the disease in them may be very inconspicuous, must increase the care with which symptoms of infection in these animals are sought for, and adds fresh importance to the warfare waged against them. The nocturnal and unobserved habits of the hedgehog and its undoubted high susceptibility make further inquiries concerning this animal important.

(3) The carcasses of animals that have been killed during the infective period may contain deposits of active virus for long periods after they have been subjected to various pickling processes, or when they have been kept at low temperatures. Pigs can become infected by feeding on parts of such carcasses, especially on crushed bones. It is clear that importation of infected meat or offals in a chilled or frozen state is a ready means by which infective material can be brought to this country, and that one way in which the infection may be transmitted to farm animals is by feeding pigs. Whether this source of infection is operative or not depends on the state of the animals at the time and place of slaughter and on how the carcasses are disposed of after arrival in this country.

Preventive and Curative Treatment.—Apart from inoculation with serum or vaccines, no special methods of countering the infection by means of drugs have been discovered. Hyperimmune serum in large doses may reduce the severity of an

attack. Many claims have been made that the disease can be prevented or an attack cut short by the injection of chemical substances, but none have so far stood the test of carefully controlled experiments. Very many chemical substances have been tested, but not one of them has been found to modify the course of the disease in doses that were not seriously poisonous to the animals (*Third Prog. Rept.*, p. 81 ; *Fourth Prog. Rept.*, pp. 126, 212). In conclusion, the following passage from the Fourth Progress Report may be quoted :—

"It may be said with confidence that during the past two or three years the knowledge of foot-and-mouth disease, the conditions which promote the infection and the means for its prevention have been materially advanced by work in many parts of the world and that the research workers in this country have taken their fair share in furthering that progress."

* * * * * *

IMPROVEMENT OF ROUGH AND HILL GRAZINGS

II.—APPLICATION OF MANURES SUPPORTED BY HEAVY GRAZINGS

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THE outstanding fact brought out by the survey discussed in the previous article* was the profound effect of heavy grazing, which pointed to the desirability of conducting manurial trials in conjunction with excessively heavy and accurately controlled defoliation. This conclusion was further borne out by the observations made in connexion with standard "manuring for mutton" trials conducted by Jones and Stapledon and reported on in 1916.† The whole trend of the evidence indicated that improvement should be sought in terms of a decisive alteration in the botanical composition of the sward rather than in increased yield as such. It was decided, therefore, to study the influence of the action of the dual factor—heavy grazing, heavy manuring. The apportionment of the reaction of the sward in terms of floristic readjustments between the two elements of the factor, although of considerable ultimate scientific interest,

* See this JOURNAL, February, 1932, p. 1109.

† Jones, A. E., and Stapledon, R. G. : "The Improvement of Upland Pastures." University College of Wales, Aberystwyth. June, 1916.

presented altogether too complex a problem with which to confuse the preliminary experiments.

Two methods of experimentation were adopted. Small areas were fenced off in each case. In one scheme of trials, the grazing animal was excluded, but the herbage was cut hard to ground level at monthly intervals throughout the growing season. In the other scheme, the plots were larger ($\frac{1}{100}$ acre) and fenced off separately for each manurial treatment. Sheep were introduced into the plot-folds to effect the heavy monthly grazings.*

Discussion of Results : Experiments without Sheep.—The first series of experiments was started in 1927. This consisted of a control plot and two treatments—phosphates alone (2 cwt. superphosphate) and phosphates (2 cwt. superphosphate) with nitrogen (100 lb. of nitrogen per annum applied as nitro-chalk incrementally). The second series was started in 1928 and consisted of a control and 5 manurial treatments. In the present connexion it is only necessary to refer to two of the treatments, namely, phosphates alone (at 4 cwt. per acre superphosphate) and phosphates (4 cwt. superphosphate) with nitrogen (nitro-chalk 6½ cwt. per acre, applied incrementally), potash (kainit 4 cwt.) and lime (5 tons).

Fescue-Agrostis Pastures : Yields.—As regards yield, the most striking result brought out in the first series (1927) was the marked influence of the addition of nitrogen.

The following are proportional results, in terms of air-dry green eatables from which dead material had been removed : Control 100 : P 104 : PN 309.†

In the second (1928) series, the results were equally striking, giving this ratio : Control 100 : P 120 : CaPKN 308.

The combination of complete manuring with the drastic defoliation, moreover, had the effect of reducing the dried herbage and moss present throughout the season (1927 series) from about 24 per cent. to under 6 per cent.

* Full particulars of the first method of experimentation with detailed results are reported by Stapledon and Thomas in Bulletin Series H. No. 11 of the Welsh Plant Breeding Station, and by Wm. Davies and T. E. Jones in the *Welsh Journal of Agriculture*, Vol. VIII (in the press). A detailed report on the second method will be published from the Station at an early date. It is only possible in the present article to refer very briefly to such results as are pregnant with implication in connexion with the economic improvement of hill grazings.

† The symbols used in the article indicate : N = Nitrogen ; P = Phosphate ; K = Potash ; Ca = Lime.

In considering this striking influence of nitrogen (when supported by phosphatic manures), both in reducing dead material (superficial mat) and in increasing the yield of green eatables, it is, of course, necessary to remember that we are dealing with swards to all intents and purposes devoid of leguminous herbage. The influence of nitrogen has not, however, ended with the above-mentioned benefits, for, as Fagan and Davies* have shown, on many of these upland soils the recovery of nitrogen in the herbage is greater in amount than that applied in the fertilizer. It follows that important bio-chemical changes in the soil are initiated by such applications—a matter of supreme importance when it is primarily desired to establish a new and different equilibrium between the various contributing species of grasses, and especially when it is desired by sowing to introduce " better " grass species and so further and the more completely upset an equilibrium that has been utterly stable for decades —and, in all probability, for centuries.

Botanical Composition.—On a *Fescue-Agrostis* pasture one effect of complete manures (PN or CaPKN) and heavy grazing is to increase the grasses at the expense of the non-gramineous vegetation ; and, since the ordinary miscellaneous herbs on such a sward (*e.g.*, heath bedstraw, Tormentilla, sedges and wood rush) are not palatable, and are eaten to a very slight extent, this, in itself, constitutes a very considerable improvement. On the average of the results from the 1928 series of experiments, weeds were reduced from 32·6 per cent. on the control plot to 19·5 per cent. on the CaPKN plot, while, on the P plot, the weeds stood as high as 27 per cent. The addition of nitrogen to the basal mineral dressing also tends to increase bent more than it does sheep's fescue, and sometimes at the expense of the fescue, although this change does not always show itself to any marked extent till after a few years of treatment. In the 1927 series of experiments, bent was increased, as the result of but one year of treatment, from 21 per cent. on the control plot to 35 per cent. on the PN plot, while the fescue was only increased from 25 per cent. on the control plot to 32 per cent. on the PN plot.

In the case of the 1928 series, at the end of the second year of treatment there was no appreciable difference between the fescue-bent ratio on the control and CaPKN plots

*Fagan, T. W., and Davies, R. O. : "The Recovery of Nitrogen in Pastures from the Application of Nitrogenous Manures." *Welsh Jour. Agric.*, VI. Part I. (1930) p. 208; Part II. The Recovery of Nitrogen in Ordinary Swards." *Ibid.*, VII. (1931), p. 268.

respectively, but by the end of the third year of treatment the ratio had been altered very much in favour of bent on the latter plots. The magnitude of the difference is shown by the figures hereunder :—

	Control *Per cent.*	*CaPKN* *Per cent.*
Sheep's fescue	46	30
Bent	38	61

Thus, it would appear that one very important effect of complete manuring plus drastic defoliation is to prevent domination by sheep's fescue. This is important for many reasons, by no means the least far-reaching being that bent gives a better seasonal distribution of palatable herbage than does the fescue. The bent, for example, is far more productive than the fescue in September. Thus, in the 1928 trials on the CaPKN plots, bent was contributing 44 per cent. while the fescue was contributing 36 per cent. The bent is decidedly the more winter-green of the two grasses. Yorkshire fog, present to an extent of less than 4 per cent. on the control plots, was increased to over 10 per cent. on the PN (1927 series) plot.

Molinia Pasture: Yield.—The yields from the *Molinia* pastures under complete manures are increased to very nearly the same relative extent as the *Fescue-Agrostis* pastures. Thus, in the 1928 trials, with the control plot at 100 the CaPKN plot registered a yield of 298.

Botanical Composition.—The equilibrium of a *Molinia* pasture is very rapidly upset by the combined influence of heavy defoliation plus complete manures. The results given in Table I are highly instructive and show that a *Molinia* pasture can be radically altered to great floristic advantage, and this during a period of no more than two years.

At the commencement of the experiment and before the treatments were started, *Molinia* was contributing over 60 per cent. to the vegetation, sheep's fescue hardly 6 per cent. and bent less than 3 per cent., while the dead herbage (throughout the year) accounted for nearly 30 per cent. Even by the end of the first year, the fescue had risen to 17 per cent. and bent to 21 per cent. on the PN plots. By the second and third years, the extent of the transformation had been, to say the least of it, surprising. The bent and fescue together had now definitely taken the dominant position at the expense of the *Molinia*, and thus from the point of view of the ecologist, no less than that of the sheep, the sward had been altered out of all recognition, and in a direction

TABLE I.—To show the influence of drastic defoliation plus complete manures on a *Molinia* pasture. The figures are given in terms of percentage productivity of the species concerned on the sum of the yields throughout the season.

Species of grass	Second year of treatment			Third year of treatment		
	Control	P	PN	Control	P	PN
Molinia	40	26	18	44	29	15
Sheep's fescue ..	28	39	24	22	20	33
Bent	3	19	54	5	26	41
Dead matter* ..	21	10	2	18	10	3

* Very largely *Molinia*.

highly favourable to the latter. The appearance of the plots, as is usual in these cases, was altogether more illuminating than any possible statistical statement of the facts.

Nitro-Chalk compared with Sulphate of Ammonia on a Molinia Pasture.—Considering that the addition of nitrogen (in the form of nitro-chalk) to the phosphatic dressing had been a decisive factor in producing botanical changes of such magnitude, it was decided to set up an experiment in 1930 to compare nitro-chalk with ammonium sulphate, a foundation of superphosphate being given in both cases. The results in terms of percentage productivity obtained during the second year (1931) on a *Molinia* sward with an original *Molinia* contribution of about 70 per cent. are shown below :—

	*Phosphates with nitro-chalk**	*Phosphates with ammonium sulphate**
Molinia	5 per cent.	33 per cent.
Sheep's fescue ..	15 ,,	49 ,,
Bent..	76 ,,	9 ,,

* The dressings of nitrogenous manures were advisedly heavy with a view to exaggerating the results as far as possible. Nitro-chalk was applied in incremental dressings at the rate of 8 cwt. per acre and sulphate of ammonia at the rate of 6 cwt.

We are not here concerned with the physiological implications of the above very striking result. From the point of view of advisedly tipping the balance of vegetation in any required direction—important enough in all conscience—the significant thing is *the difference in behaviour* as between sheep's fescue and bent in their reaction to the two manures, and generally speaking it is bent that we desire to encourage on the types of hill grazing we are considering.

Experiments with Sheep.—Yield data are not yet available from these experiments, but floristic data are available and generally confirm in marked degree those discussed above, where the defoliation was effected by incremental cutting.

In the present connexion, it must suffice to allude only to the results from the control and PKN plots at one centre, namely, at Lletyevanhen, about 1,000 ft. above sea level.

Agrostis-Fescue Pasture.—Weeds, moss and "burned" herbage had been decreased from 16 per cent. on the control plot to 6 per cent. on the PKN plot by the second year of treatment. Sweet vernal grass had increased from 1 per cent. on the control plot to 6 per cent. on the PKN plot. The ratio fescue-bent was already slightly more in favour of the bent on the PKN plot than on the control—the fescue having been increased by 1 per cent. and the bent by 5 per cent.

Molinia Pasture.—Starting on a *Molinia* pasture with about 50 per cent. green *Molinia* leafage, not more than 15 per cent. sheep's fescue and only traces of bent, the average percentage productivity of the contributing species had attained to the very striking figures set out below in the second year of treatment :—

	Molinia	*Fescue*	*Bent*	*"Burned" leafage*
Control plot ..	29	31	7	21
PKN	7	56	31	3

Here, then, we have a result even more striking than that given on the plots defoliated by shears. The *Molinia*, from contributing not less than 50 per cent. to the herbage at the outset (in fact, considerably more, since most of the "burned" herbage was *Molinia*), as the result of heavy grazing with sheep supported by PKN has actually been reduced to but 7 per cent., while bent has risen from being merely a "distributed plant" to a position of co-dominance with sheep's fescue. The fescue itself has increased practically four times in amount on the PKN plot. All this has occurred in the space of but two years—a truly remarkable ecological change, of the profoundest significance in connexion with the improvement of hill grazings, to which *Molinia* pastures (as opposed to excessively wet *Molinia* bog areas not amenable to improvement by the methods here discussed) make such a large and such an unsatisfactory contribution.

Conclusions and Recommendations.—The experiments discussed have shown that the addition of a nitrogenous fertilizer (nitro-chalk) to a foundation of phosphatic manures, if supported by drastic defoliation (by shears) or heavy incremental grazing by sheep, tends to bring about a rapid alteration in the floristic relationships of open, hill grazings.

These alterations are favourable alterations, and constitute considerable improvements in the swards despite the fact

that they have occurred in the entire absence of leguminous herbs and therefore, of necessity, have not increased any clover content of the herbage.

In the case of *Fescue-Agrostis* pastures, the miscellaneous weeds will be greatly reduced. Grasses like Yorkshire fog and sweet vernal grass, if present in small amount, will be very considerably increased.

The ratio fescue-bent tends to be altered in a direction favourable to bent; this alteration may not be very apparent at first, but it will be of considerable magnitude after the treatment has been continued for some years. These changes will give a better seasonal distribution of herbage to the sheep, and the sward as a whole will be decidedly more palatable and will remain longer in a palatable condition.

In the case of a *Molinia* pasture, the fescue and bent will tend to replace the *Molinia* and thus to alter the sward entirely; in fact, from the point of view of the sheep, to improve it out of all recognition. Of even greater ultimate importance, perhaps, is the fact that a sward will have been developed more favourably to both the reception and retention of white clover, the significance of which will be rendered apparent in the concluding article of this series.

The addition of a nitrogenous fertilizer to the phosphate foundation has had a remarkable influence on yield. Proportionately, the responses to PKN on the open hill grazings have been altogether greater than on lowland pastures. The recovery of nitrogen in the herbage of these hill pastures has been greater than the amount supplied with the manure, which indicates the occurrence of important biochemical reactions in the soil.

The practical questions that arise are, firstly, how to control the grazing, and, secondly, how to convey the manures to the appropriate areas. The answer to the first question rests largely on the fact that "once grazed heavily, always grazed heavily"*—for such is the habit of sheep. This means

* Ample justification for the above aphorism can be seen on open grazings. Quite recently some of Mr. Moses Griffith's experiments in Merionethshire presented an excellent example. Areas (about 2 acres) had been sown down within much larger enclosures and not fenced off separately some years previously, and the sheep had kept them very hard grazed. These particular areas were full of white clover and, therefore, calcium efficient. Even if other areas might have deteriorated to some extent as the result of under-grazing the improved, mineral-efficient and heavily grazed areas would assuredly have been far more than a set-off. Moreover, never let it be forgotten that the obvious lesson from areas such as this—and they occur as the result of various happenings all over our sheep walks—is to extend the acreage of improved sward.

that only temporary fencing is necessary—and the area of improvement may be gradually extended by the annual movement of a sheep netting quite "casually" run across a hillside. The point to be emphasized is that the grazing must be heavy and incremental. The improvement must be initiated not only by manures but by the periodic turning of a very large flock of sheep on to an area that a hill farmer would regard as very small. The size of the area is a function of the size of the flock.

The caterpillar tractor, a suitable lorry and a sleigh will solve all questions of transport.

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THE WORKING OF THE SEEDS ACT, 1920, IN THE SEASON 1930-31

THE general effect of the last season's work in the administration of the Seeds Act, 1920, has been to confirm the opinion that a steady and even marked improvement has taken place in the tone of the trade as a result of the existence of the Act. Almost without exception, the important seed firms up and down the country faithfully endeavour to carry out the spirit of the law. As a result, the general standard of seed has been raised, and a poor sample is an exception.

No man welcomes restriction for its own sake. Since "whole-time" seedsmen—men who live by their seed trade—usually have no fault to find with the principles of the Act, it is reasonable to infer that they themselves, as well as their customers, derive benefit from it. Firms whose names are household words would not, of course, lightly risk their reputations; but it is something to them to know that those of their competitors who have less at stake must also run their businesses along ordered lines. The middleman also has the satisfaction of feeling that he can rely upon the analytical statement he receives from his supplier.

In times of financial stress more particularly there is bound to be a tendency towards price-cutting; and price-cutting is likely to lead to reduced quality. The system of inspection and sampling, however, extends into every part of the country. It is co-ordinated and it is responsive. The result is that while the farmer enjoys a substantial measure of

protection from misrepresentation, the seedsman knows that, keen as the competition may be, it is at least not fraudulent competition.

For some few years past there has been a growing inclination among retailers to buy later and in smaller quantities. Their object is, in part at least, to prevent spoiling by storage, and especially to avoid carrying over yearling stocks. It is obvious that the change is to the advantage of the ultimate purchaser, though, from an administrative point of view, the shortening of the seed-selling season has necessitated some small adjustments in the work of inspection and sampling.

Licensed Seed Testing Stations.—The Act of 1920, which authorized the setting up of official Seed Testing Stations, also empowered the Minister to grant licences allowing approved firms themselves to test seeds for the purposes of their own sales. One such licence has been surrendered during the year, leaving 81 remaining in operation.

Thirty-one of these licences permit the holders, most of whom are prominent firms in the seed world, to test all kinds of seeds. The remainder are limited in their scope. Twenty-eight of them relate to cereal seed only, while others include cereals and field seeds generally, or a selection of these.

The operations of the licensed stations are a matter of considerable moment, since the firms concerned form the channel through which a very large part of the farming community draws its seed supplies. All stations are required to retain a portion of each sample tested. The stations are visited at intervals and a selection of these samples is taken for check testing at the Official Station. By these and other methods a close scrutiny is kept over the accuracy of the work carried out. The "reserved portions" taken during the season totalled 1,451, including 456 of grasses and clovers and 268 of field seeds, the remainder consisting of cereals, pulses, vegetables, and occasional samples of sugar beet and linseed.

It is the practice, where discrepancies of any importance occur, to take the matter up with the private station in order to discover the cause. Every effort is constantly made to secure uniformity in methods and results.

Visits to Seedsmen.—There was a small decrease, amounting to some 6 per cent., in the number of visits paid to sellers for the purpose of ensuring that the seeds offered for sale accord with the particulars declared in respect of them, and

that, in other respects, the requirements of the Act are fulfilled. During the 1930-31 season, 5,973 calls were made, of which 866 were to firms not previously visited, as compared with 6,370, including 1,120 "new" visits, in 1929-30.

The firms called upon include the leading agricultural seed firms, general agricultural merchants, corn-chandlers and seedsmen, "chain" stores, greengrocers, ironmongers and chemists, and a proportion of the many thousands of those who accept agencies for one or other of the brands of packeted seed on a "sale or return" basis.

During the last few years, irregularities among the seedsmen proper—that is, those to whom seeds are not merely a side line—have been few and, as a rule, of a technical nature. Most of the difficulties encountered are with those whose trade covers a number of different commodities and who stock seed only during a short period of the year. Their business doubtless brings them into touch with regulations governing the sale of many other articles; and some of them seem to find difficulty in grasping and remembering those relating to seeds. The printed notices distributed by Inspectors, together with a friendly word of caution and advice, are generally sufficient to put these sellers on the right lines. It is perhaps all to the good that this class of business is steadily giving place to the extending trade in packeted seed.

The better-informed retailers appreciate the value to them of legislation under which they obtain from their wholesalers a guarantee that is always liable to be tested officially. Many of them welcome the taking of samples on their premises because they are not themselves in the habit of obtaining further tests and are, therefore, glad of an occasional check.

Packeted Seeds.—The increase in the number of agents for packeted seeds has been very noticeable for some years past, and is evidently continuing. A large part of the trade is in the hands of a few of the leading firms, whose agents may be found in every town and village and whose trade is on the "sale or return" principle. From the somewhat different points of view of retailers, purchasers and those charged with the enforcement of the Act, the extension of this class of business makes for simplicity and satisfaction. It frequently happens that packet agents have no knowledge whatever of either seeds or the Seeds Act; but under this scheme they are unlikely to find themselves infringing the law so long as they remember to send back all unsold packets at the end of the season.

At the same time, there are many firms with smaller but growing connexions, and some of them sell outright to the retailer. It is this last-mentioned section of the packet trade that cannot be adequately controlled merely by watching the channels through which primary distribution takes place. Some supervision of the retailers is necessary to prevent seed being held over from year to year and sold without re-testing.

The special arrangements made during last season by the Central Allotments Committee for supplying unemployed workmen with seeds at reduced prices afforded an unusual opportunity to apply an official check. Control samples of several kinds of garden seed were taken from each of the contracting firms. Practically all reached the standards of purity and germination claimed for them, and the standards were for the most part higher than the minima authorized by the Seeds Regulations.

Visits to Farmers.—Owing to a number of circumstances, there was a substantial decline in the number of farmers visited on Seeds Act matters in the course of the season. The actual number of such visits recorded during the year was 594, but this figure does not take account of the many individuals who have been seen at agricultural shows, markets and meetings of other descriptions.

It is difficult to estimate the total number of farmers whose attention has now been drawn to the Act by one means or another, but the figure must exceed 5,000 and may be nearer 10,000. For several years it has been the practice to stage Seeds Exhibits at both major and minor agricultural shows, to arrange for lectures at young farmers' classes and other meetings, and to seize such useful opportunities as presented themselves for distributing literature on the subject. In some counties the agricultural education officers make a point of introducing the subject into their courses, and it is hoped that this practice will spread.

Conditions vary in different parts of the country, but general indications suggest that sales of untested seeds by farmers are diminishing. So far as the 1930-31 season is concerned, this may be due in part to the poor harvest; and the general demand for long credit may also have some bearing upon it. It is certain, however, that a larger proportion of the seed offered for sale in farmers' advertisements is now described as "Government tested"; and that gives ground for the hope that those "farmer sellers" who have so far

evaded their responsibilities may be compelled by "farmer buyers" to fall into line.

It may be observed that "farmer buyers" generally—for whose protection the Act so largely exists—can do much to make it effective if they will only insist on getting from their suppliers, whether seedsmen or fellow farmers, the particulars they are entitled to receive.

Control Sampling.—The number of samples taken during the year for the purpose of checking the particulars declared on the sale of seeds was 1,406. They included 323 of clovers, 145 of grasses, 49 of cereals, 83 of sugar beet, 118 of other field seeds, 427 of "loose" garden seeds and 259 of packeted seed. The results of testing the packet samples were a little disappointing, disclosing, as they did, 15 cases, or nearly 6 per cent., of germination discrepancies. One-half of these were clearly due to the fact that the retailer had held the seed over from one season to another.

Apart from the packeted seed samples, it was necessary to draw attention to 57 instances of discrepancies in the particulars declared and 50 of omissions from the declarations. The 20 purity discrepancies included 2 in respect of grasses, 9 of clovers and 9 of field and garden seeds. Three of the 37 discrepancies in germination figures were in relation to grasses, 6 related to field and garden seeds, and no fewer than 28 to clovers. The poor harvesting conditions of the previous year doubtless had much to do with the rapid loss of vitality on the part of red clovers in particular. Six of the purity discrepancies were within 3 per cent. of the declared figure, 7 showed a variation of between 3 and 5 per cent. and 7 were of more than 5 per cent. Of the germination discrepancies, 14 were of less than 10 per cent. and 17 others were of less than 15 per cent., leaving 6 in which the difference between the germination declared and that found by tests amounted to more than 15 per cent. Viewing the non-packeted seed samples as a whole, the figures show that 7·5 per cent. of them called for special attention, 1·4 per cent. by reason of the purity, 2·6 per cent. on account of germination, and the remaining 3·5 per cent. because of some omission from the declaration.

Seed Potatoes.—From the point of view of enforcement, the seed potato trade has been generally regarded as the least satisfactory part of the whole of the business operations coming within the purview of the Act. In the planting season —and particularly if the supply of seed potatoes is rather

above the average—many greengrocers and other retail tradesmen who know nothing of the Act are persuaded to undertake their sale; and since seed potatoes in small quantities are sold "loose," no way has yet been found to overcome the difficulties by adopting measures similar to those that have so simplified the packeted garden-seed trade. A definite improvement in complying with the regulations is reported for some areas, but this section of the trade continues to require watching, and the sellers to need reminding, in order to secure proper observance of the Act. Minor contraventions on the part of sellers are, however, generally rectified after a few words of explanation.

A few years ago, auction sales of seed potatoes were a frequent source of difficulty, and irregularities are still apt to recur. Much has been done, however, by personal interviews with auctioneers, to secure compliance, and even assistance, from them. Several are known to be impressing upon senders the need to attach full details as to class, variety, size and dressing, and certificate number, and to be refusing to sell at seed auctions potatoes that are not accompanied by those particulars.

It has been necessary to investigate six cases of alleged false statement as to the variety of seed potatoes and two in which the declaration was missing or incomplete. Four of the lots that were wrongly described were English seed. Two of them were examples of potatoes sold by auction, but in neither case could proceedings be taken owing to the lack of evidence that the tubers were sold for planting. The circumstances of the third case seemed clearly to point to the potatoes having been sold merely as "pig potatoes" or "smalls," and no action was taken against the supplier. In the fourth instance the seller was warned that serious notice would be taken of any further contravention on his part. In one instance it was believed that particulars had not been given, but the purchaser was found to be uncertain on the point. The second appeared to be due to a misunderstanding, and the seller was cautioned. Most of these cases point to the importance of seed potato buyers insisting on getting a written statement when they make their purchases, or reporting the facts to the Ministry at once if they fail to get it. If nothing whatever is done until the crops are lifted, several months later, it is almost inevitable, in the absence of something in writing, that there will be doubt and dispute as to the circumstances of the sale.

Two cases where seed potatoes emanating from Scotland were wrongly described were referred to the Department of Agriculture for Scotland. The inquiries made by the Department in one case indicated that the seed had been inadvertently mixed ; and in the other it transpired that evidence of mixture was available in respect of only a small part of the original consignment. In these circumstances legal proceedings were not taken, but in both instances the attention of the sellers was called to the need for strict compliance with the Act.

Course and Examination in Seed Testing.—Owing to the small number of applicants for a course of training in seed testing, it was decided not to hold, during 1931, a course and examination on the lines of those conducted at Cambridge in recent years. Arrangements were made, however, for the analyst employed by a firm holding a seed-testing licence to attend the Station for a few days' instruction.

Seed Analysts' Conference.—It has been found generally convenient that the conference of commercial seed analysts, which has been arranged by the National Institute of Agricultural Botany annually since 1922, should follow directly after the seed-testing examination. As no examination was held in 1931, and much of the time of the officers principally concerned was likely to be taken up with international and other engagements, it was decided not to issue the usual invitations.

Fees for Seed-Testing.—As an experimental measure, it was decided to bring into operation, *for the current seed season*, the following modifications in the scale of fees charged at the Official Seed Testing Station :—

(1) *Purity Tests only.*	
(*a*) Clover seeds (including examination for presence of Dodder).	Fee to be 3*s.* 6*d.* per sample.
(*b*) All other seeds.	Fee to be one-half of that chargeable for a complete test.
(2) *Garden, Vegetable and Root Seeds.*	A 20 per cent. rebate to be given on the existing fees for samples of garden, vegetable and root seeds received between August 1 and September 15, on the condition that the Station is under no liability to test the samples immediately on receipt, but is at liberty to fit the testing in at a convenient time.
(3) *Deposit Accounts.*	Firms who have deposit accounts and send 400 samples or over during the season to have a rebate of 15 per cent. credited to their accounts.

Hitherto, the charge for a purity test alone has been the same as that for a complete test. The lower fees for garden, vegetable and root seeds submitted immediately after the end of the seed year afford a cheap means of obtaining re-tests of yearling seed. It is anticipated that these, and the further reduction now given to firms sending in large numbers of samples, may encourage a fuller use of the services offered by the Official Station.

Prosecutions.—Only two prosecutions were instituted in England and Wales during the season for offences against the Act. In the first instance, a merchant firm was charged with making a false statement as to the purity and germination of seed tares, but the summons was subsequently withdrawn, with the permission of the Bench, on payment of agreed costs amounting to five guineas. The second charge was against a retailer for making false statements as to the germination of onion and parsnip seed sold in packets. Both lots were described as of "not less than the authorized minimum" percentage of germination, but the parsnip seed was found to be wholly dead and the onion seed germinated to the extent of 8 per cent. only. The sellers were fined 10*s.* for each of the two offences.

Seed Analysts' Bulletin.—Issues of the Bulletin were circulated in September, 1930, and in May, 1931. They gave full particulars of the results of testing "Referee Samples" at the licensed seed-testing stations, and the results of the examination for seed analysts held at Cambridge during 1930. Other matters dealt with in these Bulletins included notes on the English scheme for the certification of wild white clover seed; on crop certification in New Zealand; on the administration of the Act in England, Scotland, Northern Ireland and the Irish Free State; on the Canadian Seed Laws; and on import restrictions imposed in a number of countries.

General.—A convenient summary of the provisions of the Act, showing also the fees chargeable for tests and the quantities to be sent, may be obtained free of charge from the Ministry's office, 10 Whitehall Place, London, S.W. 1. Copies of the Seeds Act, 1920 (price 3*d.* net); the Seeds (Amendment) Act, 1925 (1*d.* net); and the Seeds Regulations, 1922 (3*d.* net), can be purchased, either directly or through any bookseller, from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2, and branches.

CABBAGE ROOT FLY AND METHODS FOR ITS CONTROL

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THE Cabbage Root Fly, notorious as a pest of plants of the cabbage tribe, occurs throughout Great Britain, Europe, Canada and the United States; and in this country is regularly responsible for enormous financial losses, not only in gardens, but in the field. Of the cruciferous crops, cauliflowers and cabbages suffer the most damage, but Brussels sprouts, broccoli and occasionally kale, turnips, swedes and radishes are also attacked. Young plants suffer more severely from attacks than older ones, particularly when grown on a light, open soil.

The damage is caused by the maggots of the fly feeding on the roots of the plant, although cases are known of damage to the stems (above ground) and leaf stalks.[1]*

To effect control of this pest, numerous measures have been advocated, these being intended either to destroy the maggots, or to prevent the fly from depositing eggs near the plants. With very few exceptions, none of these measures can be recommended as sufficiently practical to merit adoption. The Ministry's recently revised leaflet† gives a brief account of the three most promising direct methods so far discovered, namely, (1) tarred felt discs, (2) naphthalene, and (3) corrosive sublimate.

During the past season (1931), comparative control trials of these three methods were carried out by the writer at five centres in the West Midland Province. In addition, treatment by weak solution of alum was also included in the trials. The comparative degrees of control thus obtained was very uniform at all centres; but it should be emphasized that the experiment must be regarded as a preliminary one, and that further extensive trials must be conducted over several seasons before final conclusions can be reached.

Symptoms of Attack.—Attacks on cauliflowers and cabbages are manifested, in the first instance, by the poor growth and dull, leaden colour of the leaves, and, subsequently, by wilting of the plant. Examination of the root system will reveal that most or all of the finer roots have been eaten away (see

* For references see p. 1237.
† See Ministry of Agriculture Advisory Leaflet No. 18.

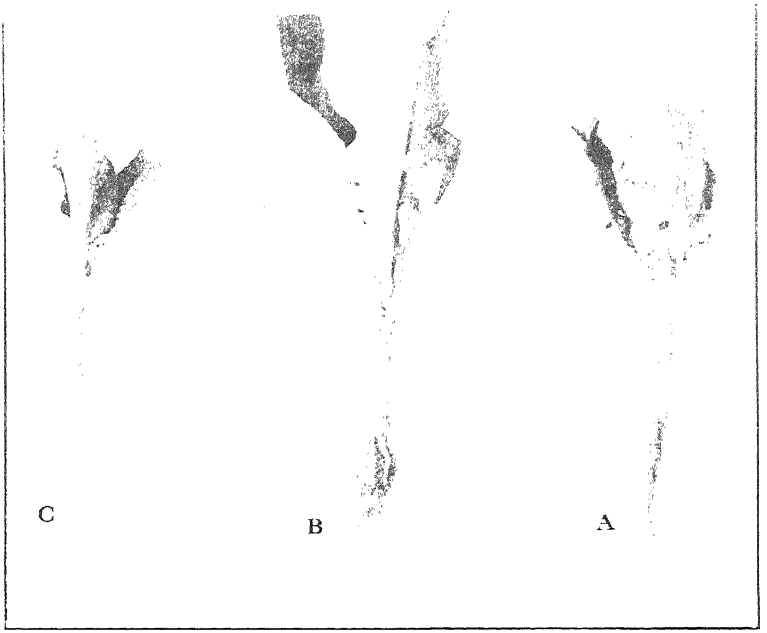


FIG. 1.—A. Cauliflower from control (untreated) plot: all finer roots destroyed by Cabbage Root Fly. B. Cauliflower from plot treated with corrosive sublimate; well-developed root system. C. Cauliflower from control (untreated) plot; new roots produced above site of attack by Cabbage Root Fly.

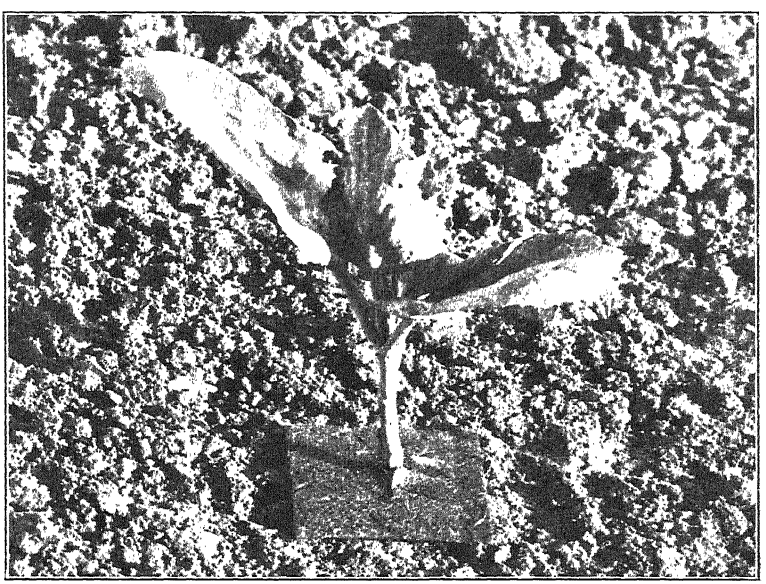


FIG. 2.—View of a cabbage plant showing tarred disc in position.



FIG. 3.—View showing appearance of cauliflower crop on plot treated with corrosive sublimate.

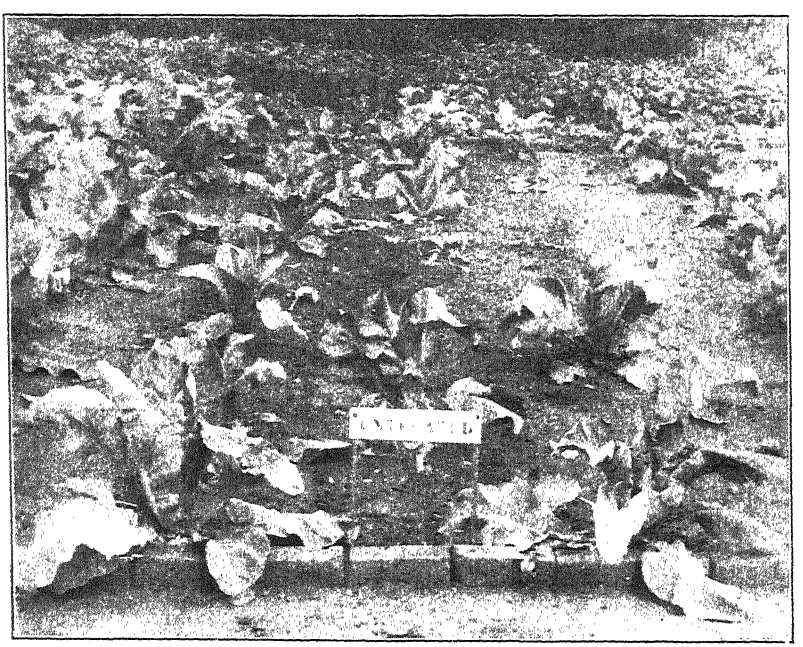


FIG. 4.—View showing appearance of cauliflower crop on control plot (untreated) in same garden as corrosive sublimate plot (Fig. 3).

Fig. 1A) and in most cases maggots will be found in the main stem or root and in the adjacent soil. These leaf and root symptoms become more pronounced in time and unless new roots (see Fig 1C) are rapidly produced the plant either dies, or, at best, makes only poor growth.

Life History and Habits.—Considerable attention has been given to this pest during the past 20 years, and a fairly detailed account of its life history and habits is given by Brittain[2] and in the Ministry's Advisory Leaflet No. 18. To understand the application of the control measures here recommended, it must be emphasized that two or three broods are produced each year, but that it is usually only the first of these that causes any serious damage. The flies of the first brood appear in most districts during May and early June. The females lay their eggs just below the soil surface on, or close to, the main stem or root of the plants. Immediately after hatching, the maggots work their way down to the fibrous root system of the plant. The finer roots are eaten away and eventually nothing remains but the main root (or stump), which is also usually badly attacked (see Fig. 1A). When fully grown, the maggots pupate in the soil; such pupæ give rise in due course to a fresh brood of adult flies.

Experimental Treatments.—In 1931 the four control treatments mentioned were tested on cauliflowers :—

(*a*) *Corrosive Sublimate* (*Mercuric Chloride*).—This chemical was used at a strength of 1 oz. in 8 gal. of water. About ¼-pint of the solution was allowed for each plant and applied so as to flood the soil evenly around the base of the plant. Three applications were made at approximately 10-day intervals, starting four days after setting out the plants,* the object being to kill young maggots before they could do any serious damage to the root systems.

(*b*) *Naphthalene.*—The grade of naphthalene used was "drained creosote salts." About ¼ oz. of this powder was applied by hand to the soil round the plants, care being taken to avoid, as far as possible, sprinkling the powder on the plants, which might otherwise be scorched. Applications were made on three occasions at seven- to ten-day intervals, starting immediately after planting out, the object being to prevent the fly from laying eggs.

(*c*) *Tarred Felt Discs.*—These discs (see Fig. 2) were placed round the stems of the plants directly after planting out. Care was taken to place the discs perfectly flat on the ground and to keep their surfaces free from soil for, at least, the first five weeks, to prevent the fly from depositing eggs near the plants.

(*d*) *Alum.*—This substance was used at a strength of 2 oz. in 1 gal. of water; the method, time and rate of application were similar to those adopted for corrosive sublimate.

* Corrosive sublimate, being highly poisonous, should be handled with great care. It should be clearly labelled and kept under lock and key in charge of a responsible person. In these trials, all vessels used for it were thoroughly washed after each application.

Plan of the Experiment.—Five centres were selected for the trials, three being school gardens (at Alrewas, Burntwood and Lichfield), while the other two were farms. The four experimental treatments were tested at each of the five centres, the experimental area in each case being divided into six plots :—

Plot 1.—Corrosive sublimate solution.
,, 2.—Control (untreated).
,, 3.—Tarred felt discs.
,, 4.—Alum solution.
,, 5.—Control (untreated).
,, 6.—Naphthalene.

100 plants per plot were used at the school garden centres and 400 plants per plot at each of the remaining two centres.

At all centres the plot treated with naphthalene was well separated (about 40 yards at the farm centres) from all the other experimental plots, to eliminate any possibility of the fumes from this chemical substance affecting the incidence of the fly on neighbouring plots. Further, plots 2, 3, 5 and 6 were given an equivalent quantity of water to that used when applying the corrosive sublimate and alum to plots 1 and 4.

Plants Used.—Cauliflowers, as stated, were used for the experiment at all centres, the variety chosen being Veitch's Autumn Giant. The seeds were sown in boxes under glass at the end of March and the plants set out on the experimental plots in the early part of June. The distances of planting were 2 ft. between the rows and 1 ft. 6 in. between the plants in the rows. No dung was applied in the spring, but a dressing of a complete artificial manure, at the rate of 10 cwt. per acre, was added, a few days before planting, to both treated and control plots at all centres.

Observations on the Plots.—At all centres, the plants made fairly rapid growth on both treated and control plots, and very little difference could be detected at first between the various plots. By the middle of July, however, there was a decided contrast. It was evident that both corrosive sublimate and naphthalene, in addition to giving control of the Cabbage Root Fly, exerted a considerable influence on growth, the plants receiving their applications being vigorous and considerably more advanced than those on any of the other plots. Of these two chemicals, corrosive sublimate was the more effective in stimulating growth. At one centre (Burntwood), plants in the alum-treated plot were as far advanced as those in the plot receiving corrosive sublimate ; but the advanced

growth of the alum-treated plants in this instance was probably due more to favourable situation of the plot than to the treatment.

Figs. 3 and 4 are from photographs taken at one of the centres (Lichfield) during the last week in July. The difference in appearance between the control (untreated) plot and that treated with corrosive sublimate was, if anything, more marked than is shown in the views.

None of the treatments used had any harmful effects on the plants, with the exception of naphthalene at one of the centres. Here, one of the applications, made on a dry and windy day, resulted in a considerable amount of the chemical collecting, in a number of instances, on the foliage and in heaps on the soil immediately around the stems of the plants. Where this occurred, severe scorching and even complete failure of the plant was of common occurrence.

With the discs, considerable difficulty was experienced at most centres, particularly on the lighter type of soil, in keeping them perfectly flat on the ground and their surfaces free from soil. The discs were easily disturbed by high winds and their surfaces were covered with soil after heavy rains, and they were, in consequence, in need of constant attention for the first five weeks.

Results.—Table I indicates time of planting, dates of treatments, and results obtained at each of the four centres. Particulars of the trial at the fifth centre (Norton Canes) are not appended, as, being very slightly infected by the fly, the trial failed to give results of value.

In Table II are given the average percentage of attacked and unattacked plants on the different plots, and the increased percentage of unattacked plants on the treated plots over the control or untreated ones.

The Crop.—Examinations of the experimental plots were carried out on several occasions during July and August, and counts made of the attacked and unattacked plants. Healthy plants, sure to reach maturity, were regarded as unattacked whilst those attacked were pulled up for examination of the roots. The final estimates are given in Tables I and II.

Considering first the control or untreated plots (Nos. 2, 5), it will be noted that they gave the least number of unattacked plants, that is, marketable heads. The results of the application of each of the treatments, as shown by the increased number of unattacked plants, can be ascertained if the number

TABLE I

Centre	Index of plot	Date of planting	Treatment	Dates of application	Per cent. destroyed by Root Fly
Alrewas	1	June 4	Corrosive sublimate	June 8, 17, 27	Nil
	6	,,	Naphthalene	June 4, 13, 22	20
	3	,,	Tarred felt discs	June 4	22
	4	,,	Alum	June 8, 17, 27	41
	2	,,	Untreated	—	57
	5	,,	Untreated	—	62
Burntwood	1	June 3	Corrosive sublimate	June 8, 21, July 8	3
	6	,,	Naphthalene	June 3, 15, 29, July 10	14
	3	,,	Tarred felt discs	June 3	5
	4	,,	Alum	June 8, 18, July 8	27
	2	,,	Untreated	—	42
	5	,,	Untreated	—	46
Lichfield	1	June 18	Corrosive sublimate	June 22, 29, July 6	7
	6	,,	Naphthalene	June 19, 26, July 3	33
	3	,,	Tarred felt discs	June 19	30
	4	,,	Alum	June 23, 30, July 7	63
	2	,,	Untreated	—	65
	5	,,	Untreated	—	59
Harper Adams College Farm	1	June 16	Corrosive sublimate	June 20, 30, July 10	5
	6	,,	Naphthalene	June 16, 26, July 6	20
	3	,,	Tarred felt discs	June 16	15
	4	,,	Alum	June 20, 30, July 10	62
	2	,,	Untreated	—	60
	5	,,	Untreated	—	67

TABLE II (AVERAGE FOR ALL CENTRES)

Index of plot	Treatment	Percentage of plants		Increased percentage of unattacked plants over control
		Attacked	Un-attacked	
2 and 5	Control (untreated)	58	42	—
1	Corrosive sublimate	4	96	54
6	Naphthalene ..	22	78	36
3	Tarred felt discs ..	18	82	40
4	Alum	48	52	10

of unattacked plants of the treated plots be compared with that of the control or untreated plots. The highest increase is found in plots treated with corrosive sublimate (No. 1). The average percentage of unattacked plants of the plots treated with this chemical at all centres was 96 as compared with 42 for that of the controls (Table II). The increase in the number of marketable or unattacked plants due to corrosive sublimate treatment was, therefore, at the rate of 54 per cent. (Table II, No. 1). An increase in the number of unattacked plants was also obtained with the plots (Nos. 6, 3, 4) treated with naphthalene, tarred felt discs and alum, there being apparent percentage increases of 36, 40 and 10 respectively over the controls (Table II). It is doubtful, however, if the increase in number of unattacked plants with the alum treatment can be regarded as significant, since this treatment gave little or no increase at three of the centres. The probable reason for the increase at the remaining centre (Burntwood) has already been stated.

Cost of Various Treatments.—Table III gives the cost of the different treatments per 1,000 plants.

TABLE III

Treatment	Per 1,000 plants				
	Cost of material	Time taken per application	Cost of labour 10*d.* per hr.	Total cost	
				Per application	Per 3 applications
	s. d.	hr. min.	*s. d.*	*s. d.*	*s. d.*
Corrosive sublimate ..	1 10	1 15	1 0	2 10	8 6
Naphthalene	1 9	0 18	0 3	2 0	6 0
Tarred felt discs ..	15 0	4 0	3 4	18 4	18 4
Alum	1 8	1 15	1 0	2 8	8 0

The actual cost of the materials is based on the current prices at the time of the experiment, which were: corrosive sublimate, 7*s.* 6*d.* per lb.; naphthalene (drained creosote salts), 12*s.* per cwt.; alum, 5*d.* per lb.; tarred felt discs, 15*s.* per 1,000.

The time taken in applying each treatment is based on records kept at one of the farm centres. All the applications were made by the same person, and the times given are the average for three occasions. At this centre, plenty of water for the corrosive sublimate and alum treatments was available in the field in which the trials were conducted. If it had been necessary to fetch the water any distance, the cost of these two treatments would have been considerably increased.

Increase of Yield.—Table IV summarizes the increased yield of unattacked or healthy plants on treated plots over those on control plots. It also shows the cost of obtaining an increased yield of 100 *plants* by each method of treatment.

TABLE IV

Treatment	Per 1,000 plants planted out			Cost of the increased yield per 100 plants
	Cost of treatment	Number of healthy plants	Increased number of healthy plants	
	s. d.			*s. d.*
Control (untreated) ..	Nil	420	Nil	Nil
Corrosive sublimate ..	8 6	960	540	1 7
Naphthalene	6 0	780	360	1 8
Tarred felt discs ..	18 4	820	400	4 7
Alum	8 0	520	100	8 0

The number of healthy plants, and the increased number of healthy plants due to the various treatments, in columns 3 and 4 respectively, have been calculated from the figures in Table II.

Conclusions.—These trials give definite indications of the value of corrosive sublimate, naphthalene and tarred felt discs against the Cabbage Root Fly, and are in general agreement with the results obtained in experiments by Davies,[3] Holmes-Smith,[4] Jary,[5] Miles,[1] and Thompson.[6] As previously indicated, however, further extensive trials under varying weather and soil conditions are essential before final conclusions can be drawn.

These trials, taken by themselves, show that, of the three methods, corrosive sublimate is the most effective. This

method has been used for several years in Canada[2] and elsewhere with considerable success. Unfortunately, the supervision necessary in handling this intensely poisonous substance, together with the usual difficulties attendant on the employment of a liquid, render this method unsuitable for general application.

Although the results obtained by using tarred felt discs compare very favourably with those obtained by the other treatments, it became quite obvious that the high cost of the discs themselves, and the labour entailed in fixing and keeping them in position, are objections that rule out this method as of no practical value except on the very smallest scale.

The increased yield of unattacked or healthy plants due to the naphthalene treatment compares very favourably with that obtained by using corrosive sublimate. It is, however, unlike the latter substance, very easily handled, and if kept in air-tight containers is readily stored. The above considerations point to the conclusion that this method offers the simplest solution of the problem of Cabbage Root Fly control.

Acknowledgments are due to Mr. J. C. F. Fryer, M.A., of the Ministry's Plant Pathological Laboratory, and to the Staffordshire Educational Authorities and the school staffs concerned, for very kind assistance afforded in connexion with these experiments.

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POTATO-GROWING IN MID-DEVON

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Introductory.—Potatoes are not an important crop in Devon, taking the county as a whole. According to the statistics of the Ministry of Agriculture, the total area of potatoes grown in Devon in 1928 was 8,765 acres out of the total county area of 1,135,636 acres of crops and grass. This was equal to an average of 8 acres of potatoes per 1,000 acres of crops and grass, and indicates that, generally speaking, potatoes are grown only for consumption in the farmer's household and by the farm labourers.

In the earlier part of the nineteenth century, according to Tanner,* the potato was, after the turnip, the most important root crop in Devon, having been introduced into the county by Sir Walter Raleigh. Sixty years ago, the acreage grown was nearly double what it is now.

The only area where potatoes are grown to any extent nowadays, apart from one or two North Devon parishes, is a district in Mid-Devon that has Moretonhampstead as its centre. Here, in 1928, 1,309 acres of potatoes were grown on an area of 23,353 acres of crops and grass, equal to 56 acres of potatoes per 1,000 acres of crops and grass.

Geographical Features.—The soil in this area is all light and easy working. The majority of it is a light granite, but some of the lower-lying parishes on the eastern side of the district are situated on soils locally known as woodstone and dunstone. Both these latter soils are of igneous origin, or have, at least, come under the influence of the igneous formation nearby.

There is a considerable range in the rainfall of the area. On the eastern side, the annual rainfall averages less than 40 in., but on the west, in the proximity of Dartmoor, the precipitation averages between 50 and 60 in. per annum.

There is also a wide variation in the altitude at which the potatoes are grown. Some of the lower parts to the east, also the valley between Bovey Tracey and Moretonhampstead, are not more than 300 feet above sea level, but most of the land is above 750 feet.

The only town in the neighbourhood is Moretonhampstead (1,600 inhabitants), but means of transport to other centres are good. A branch line of the G.W.R., from Exeter to Newton

* Tanner, H.: The Farming of Devonshire, *Jour. R.A.S.E.*, Vol. IX, 1848, p. 463.

Abbot, via the Teign valley, serves the villages on the east, while the Newton Abbot-Moretonhampstead branch of the G.W.R., via Bovey Tracey, serves practically the whole of the rest of the area.

In the district there are several reasonably good roads that have encouraged an omnibus service through part of the area, while lorries compete with the railways for the transport of the potato crop.

System of Farming.—Potatoes constitute the main feature of farming in the district. The land does not grow permanent pasture, and practically no district in Devon has a lower proportion of its farm area under permanent grass than is found here. Rough grazings abound, and are more extensive than anywhere else in the county, except on Dartmoor. There are between 7 and 7½ acres of rough grazings for every 10 acres of crops and grass. The proportions of tillage and of temporary grass on the farm land are both above the average for the county. The arable land is divided between corn, roots and temporary grass in the proportions, approximately, of 1 : 1 : 1½. Oats make up four-fifths of the corn grown. Potatoes and turnips each account for more than one-third of the root break, the remaining portion being devoted mainly to mangolds, with some cabbage and rape. Of the temporary grass, about one-half is cut for hay, and one-half is grazed each year.

The two most popular rotations are (1) two-years ley—corn—roots—corn (seeded out); and (2) two- to four-years ley—potatoes or corn—roots—corn (seeded out). There are many modifications of these rotations, several of which include a larger root break than either of those given above.

The only livestock of any importance in the district are sheep. The sheep population is considerably higher than the average for Devon.

Tanner states that Moretonhampstead was celebrated in his day for the quality of the potatoes grown there, and he attributes this to the free nature of the soil, and to its large supply of alkali potash. This district was reclaimed from the "furzy downs" of the moor about 1700, but previously it had been cultivated very similarly to the practice of alternate husbandry followed after enclosure.

The Potato Crop.—Where potatoes are grown following a corn crop, the usual procedure is to clean the arish (*i.e.*, the corn stubble) by cultivating, drag harrowing, chain harrowing, etc., and burn the rubbish directly after harvest. The arish

is then usually ploughed some time during the winter, and a light working (*e.g.*, once or twice dragging) is often all that is needed before planting.

Where dung is applied, it is sometimes given before ploughing and sometimes after the land has been worked down. In some instances, the land is not touched until the seed potatoes are ploughed in in March or April, except, perhaps, for putting on a coating of dung.

Where potatoes are the first crop grown after breaking a seeds ley, the usual practice is either to plough the ley in winter, or else to "skirt," "halve," or "comb" the ley. These terms are practically synonymous, and indicate a shallow ploughing of every alternate furrow, so that the sod on the ploughed strip shall fall on the unploughed portion. By leaving the field like this, the vegetable matter soon rots, and can easily be worked down. On the lightest soils, it is often possible to cultivate the ley without ploughing.

Dung is not applied to ley potatoes so frequently as to arish potatoes ; where dung is applied to arish potatoes, it is unusual to plough properly before planting, though the ley may be skirted or halved. Whether ploughed, skirted, or merely cultivated, a ley takes considerably more working down than an arish.

The "seed" is usually planted some time in March or April, although a few farmers plant in February. A gang of four men and two horses plant at the rate of about an acre per day. One man and two horses plough out the furrows, one man sows the artificial manure in the furrow, and the remaining two men plant the seed. Rather more than 10 cwt. of seed per acre are planted. In most instances the artificial manures sown are compound potato manures ; probably not more than one in four of the growers mixes his own fertilizer. The general rate of application is from 10 to 14 cwt. per acre, costing about £8 per ton, and the amount does not appear to vary to any appreciable extent whether dung has been applied or not, or whether the potatoes follow a corn crop or ley.

After planting, the land is harrowed down, usually once or twice, sometimes more often. It is horse-hoed once, hand-hoed once—a man hoeing about an acre per day—and the drills are then banked up. Banking takes place at the end of June, or early in July, and the crop is then left until lifting time.

Practically every grower in this district lifts potatoes by hand. Usually the farm labour staff has to be supplemented

by casual labour at this time, and the work is often done piece-work. The rate varies according to parish, soil, crop and time of year. The most usual figure at the present time is 7*d.* per "yard" or square perch, but it varies between 6*d.* and 8*d.* per "yard." The usual rate of lifting is from 10 to 12 "yards" per day, so that it takes one man from 13 to 16 days to dig an acre. Not all workers are able to lift at this rate, while in some parishes, where the soil is particularly easy-working, a skilled workman can exceed 12 "yards" in an 8½-hour day. The term "lifting" includes raising the tubers from the ground, putting them in pits, and covering the pits with bracken, etc., and a light covering of earth. Where the crop is sold straight away, the potatoes are put into 1 cwt. bags and weighed ready for transport. The normal yield for the district is somewhat higher than the average yield for the whole county.

Marketing.—The crop is generally sold to wholesalers or merchants who pay cost of transport by lorry from the field, or by rail from the growers' station. Practically the whole of the crop is consumed in South Devon, the consuming district stretching from Exeter and Exmouth in the east to Plymouth in the west. The usual intermediaries between grower and consumer are wholesaler and retailer, and, sometimes, merchant, wholesaler, and retailer.

Exeter, Torquay and the neighbouring towns mainly consume Devon potatoes; Plymouth takes Devon potatoes until about Christmas, but with the turn of the year local supplies are generally supplanted in Plymouth by imports of Scotch and Irish and, to a certain extent, German and Dutch potatoes.

Local potatoes suffer in competition with imported supplies by the fact that they are ungraded. There is, however, a consumers' preference for a Devon potato, while local growers have a big advantage in the matter of transport charges. Potatoes can be transported from Moretonhampstead to any part of South Devon for less than 10*s.* per ton. The boat charge from Scotland to Plymouth is between 10*s.* and £1 per ton. The railway rate from the potato-growing areas of Lancashire and Lincolnshire varies from about 30*s.* to £2 per ton, depending on whether the destination is Exeter, Torquay or Plymouth. This charge has stifled any imports from these districts of late.*

*The rather exceptional conditions obtaining in 1931-32 have resulted in a few imports into Devon from Lancashire and Lincolnshire. The quantity has been negligible, however.

The advantage in lower transport rates, coupled with the preference of the consumer for a Devon-grown potato, enables the local producer to get a price that compares favourably with that obtained in other districts, in spite of the ungraded condition in which the produce is put on the market.

Varieties.—Four-fifths of the potatoes grown are either Kerr's Pink or Great Scot, slightly more of the former being grown than of the latter. Most growers produce both varieties, but Great Scot is rather less often omitted than Kerr's Pink. The only other varieties of any importance are Field Marshal and King Edward.* Kerr's Pink appear to be in the greatest demand in the Plymouth district, where this variety is easier to sell than a white potato. Great Scot is more popular with consumers in the Torquay district. Growers like to produce it in conjunction with Kerr's Pink as, being a second early variety, it is ready for digging before the latter, and consequently enables the digging period to be lengthened. Field Marshal is in demand in the chip trade, and usually makes a better price than most other varieties. King Edwards make 15*s.* to £1 per ton more than other varieties, but the soil of this district is in most cases too light for this variety, while it needs heavier manuring than the average. Arran Consul is another variety that is in good demand. Not much of it is grown at present, but several producers are trying it out.

Profits.—The low prices of the two years 1929 and 1930 tended to make growers pessimistic. Several growers consider that the crop cannot be grown at a profit if the price is less than £5 per ton. As a matter of fact, direct charges, if given a cash value (manual and horse labour, rent, manures, and seed), in most cases total approximately £20 per acre. A crop of 6¾ tons (the average yield in 1930 of 60 growers) would bring in £33 15*s.* per acre, leaving about £13 15*s.* per acre for indirect charges (establishment, exhaustion of the soil, etc.) and profit.

This margin would, of course, be reduced where the yield was less than that quoted above, or where the crop was sold at less than £5 per ton.

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*Compare in this connexion *An Economic Survey of Hertfordshire Agriculture*, p. 54. In Herts, 2 acres out of 3 of the potato acreage were King Edwards.

MARKETING NOTES

National Mark Eggs.—At the close of the third year's working of the National Mark Egg Scheme—it was launched on February 1, 1929—it is of interest to survey the present position and to note the features of importance which emerge from the progress of the scheme in 1931.

The following table, which shows the output of authorized packing stations during the years 1930 and 1931, indicates the progress made :—

Month	1930			1931		
	Total output of Packing Stations	Output under the National Mark	Percentage of output under the National Mark	Total output of Packing Stations	Output under the National Mark	Percentage of output under the National Mark
	Millions	Millions	Per cent.	Millions	Millions	Per cent.
January ..	16·6	11·8	71	21·5	16·0	74
February ..	15·5	11·0	71	21·9	17·0	78
March ..	22·1	15·7	71	31·6	24·3	77
April	24·4	17·6	72	34·6	25·0	72
May	26·0	18·1	70	32·5	23·4	72
June	21·0	14·7	70	31·5	23·4	74
July	20·0	14·2	71	26·4	19·8	75
August ..	17·4	12·6	72	22·1	17·0	77
September ..	16·7	12·0	72	23·5	18·7	79
October ..	14·2	10·1	71	21·5	16·4	76
November ..	12·3	8·7	71	18·9	13·8	70
December ..	16·3	12·4	76	24·8	19·0	77
Totals for 12 months ..	222·5	158·9	71	310·8	233·8	75

There was an increase of 88 millions in total output in 1931, and an increase of 75 millions in National Mark output, while the percentage of output packed under the Mark rose from 71 to 75 per cent. The substantial advance that these figures reveal testifies to the growing appreciation by producers of the services rendered to them by the packing stations. This progress is due not so much to the establishment of new packing stations—for the number of authorized stations remained fairly stationary round about 140—as to a general increase in supplies received by the stations as a whole. This is confirmed by the following classification of stations according to output (see overleaf).

In several instances, packing stations have increased their output by over 100 per cent. during the year, and among the

Output	No. of Stations 1930	1931
Over 5 million eggs	3	11
2 to 5 million eggs..	28	36
Under 2 million eggs	109	93

counties in which the greatest progress has been made are Lancashire, Cornwall, Essex, Norfolk, and Dorset. In the main, the packing stations that are operating most successfully are located in counties that show the largest increases in fowl population as between the two years 1930 and 1931. Taking the country as a whole, it is calculated that, making allowance for eggs that are consumed by producers themselves or disposed of at short range direct to consumers or to retailers in the area of production, National Mark packing stations handle approximately 20 per cent. of the home-produced eggs marketed through the wider commercial channels. As the National Mark Egg Scheme is voluntary, it can be claimed to have achieved success, and there is every indication of continued development.

During the year under review, there has been no important alteration in the conditions governing the scheme, but there has been a marked improvement in technique. Several stations have erected new and more commodious premises, while with the more extended use of efficient grading machines the more primitive methods of grading are tending to disappear. Improvements have also been made in candling apparatus.

The quality of supplies received by the stations has shown an improvement, this being to some extent due to the growing practice of paying for eggs on a grade basis that encourages production for quality and size. In this connexion, two leaflets have been issued by the Ministry as guides to producers and packers, viz., "The Testing of Eggs for Quality" and "The Maintenance of Egg Size."*

With the increase in output and efficiency of packing stations, a reduction in the relative costs of processing and distribution was to be expected, and, where figures are available (*e.g.*, article on Norfolk Egg Producers, Ltd., in the issue of this JOURNAL for October, 1931), this reduction is evident. Two other factors have also tended to lower working costs, viz. :—

(1) the almost exclusive use of the 15-dozen, fibreboard, non-returnable container and the 30-dozen, standard, wooden, returnable case; this standardization has led to considerable reduction in package costs; and

(2) the increased use of road transport.

* Marketing Leaflet No. 28 and Advisory Leaflet No. 44, respectively.

There has undoubtedly been a growing public demand for National Mark eggs during the year, a demand that has been stimulated during recent months by the "Buy British" campaign. A noticeable feature has been the interest shown in National Mark eggs by big business concerns, including some of the largest egg buyers in the country. Valuable connexions for National Mark eggs have been built up in the Metropolitan area, and also in the Midlands and the north of England, especially with multiple-shop buyers, who must have bulk supplies of standardized and reliable products. Public Authorities, such as the London County Council, have appreciated the advantages of buying by the Mark, and a number of public institutions have contracted for National Mark supplies. The attitude of the distributive trade is favourable, and there are instances of large wholesale distributors of good standing who are seeking to establish a reputation as suppliers of National Mark products. In the distribution of National Mark eggs, a vital service has been performed by National Mark Egg Central, Ltd., the authorized packers' own sales agency, which, by its contact with the London Egg Exchange and other wholesale markets in the densely populated areas, has disposed of about 42 million National Mark eggs during the past year.

Egg prices, generally, were lower in 1931 than in the previous year—on the average, from 2*s.* to 2*s.* 6*d.* a long hundred—but National Mark eggs in the "*Special*" and "*Standard*" grades consistently commanded the highest prices in the wholesale markets. As compared with the best imported supplies, the position of "*Specials*" and "*Standards*" is indicated by the fact that, in March and April, when egg prices were low, Danish 18-lb. packs were quoted at from 6*d.* to 1*s.* 3*d.* per 120 less than National Mark "*Specials*," and Danish 15½-16-lb. packs at from 1*s.* to 1*s.* 9*d.* less than National Mark "*Standards*," while, in November, the best imported eggs were as much as 6*s.* to 7*s.* 6*d.* per 120 lower in price than National Mark supplies of corresponding weight.

The record of the past year is one on which the poultry industry can be congratulated. Consumers are showing a greater readiness to purchase home produce of high quality, and producers and distributors have the opportunity—and the National Mark Scheme affords the means—of securing for the poultry industry of England and Wales a larger share of the egg trade of this country.

National Mark Beef.—The weekly average number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during January, 1931, January, 1932, and the four weeks ended February 20, 1932, was as follows :—

LONDON AREA

Period	*London*	*Birkenhead*	*Scotland**	*Total London supplies*
January, 1931 ..	1,944	718	2,285	4,947
January, 1932 ..	1,753	520	1,285	3,558
Four weeks ended February 20, 1932	1,812	707	1,358	3,877

*Figures include Scotch sides graded and marked in London.

BIRMINGHAM AND YORKSHIRE AREAS

Period	*Birmingham*	*Leeds*	*Bradford*	*Halifax*
January, 1931 ..	467	—	—	—
January, 1932 ..	807	438	385	115
Four weeks ended February 20, 1932	884	466	413	124

A larger number of sides of beef was graded at Islington Abattoir during 1931 than in the previous year, although the total number of cattle slaughtered was lower. The demand in the London area for home-killed beef of guaranteed high quality is being well maintained. The proportions of Scotch and Birkenhead-killed beef offered for grading and marking continue to improve.

National Mark Strawberries.—The number of growers in the National Mark Strawberry Scheme increased from 100 in the first year (1930) to 168 last year. The abnormal climatic conditions prevailing during 1931 resulted in a poor crop in most districts, but, despite this fact, it is estimated that approximately 125 tons of strawberries were marketed under the Mark.

While the scheme is still in an experimental stage, it has been demonstrated that the statutory grades are practical for commercial purposes, and that there is a definite and widespread demand for strawberries of guaranteed quality and weight packed in standard containers.

National Mark Canned Fruit and Vegetables.—Recent inquiries received by the Ministry from abroad for English canned fruit and vegetables packed under the National Mark include letters from British residents in Irak and the Federated Malay States. These letters indicate that there is a promising field for export trade with other parts of the Empire when supplies are available.

National Mark Wheat Flour.—The following firms have recently been enrolled as authorized packers :—

MacSymons Stores, Ltd., Liverpool.
Whitemores Stores, Ltd., Bridport.
E. M. Fuller, Deal.
United Caterers, Ltd., 108 Brompton Road, S.W. 3 (and branches).
Ed. Mayo & Son, Axminster.
Arthur Pearce, Kingsbridge.
Mark's Café, Ltd., Budleigh Salterton.
G. Searle & Sons, Harlow.
C. C. Heeps, Northampton.
L. J. Souter, Wootton, Isle of Wight.

Display of Home Produce.—The England and Wales Stand occupied a prominent position in the Empire Marketing Board Pavilion at the British Industries Fair held at Olympia, London, from February 22 to March 3. The Ministry, in conjunction with the National Farmers' Union, was responsible for staging a representative display of home produce.

Publicity for National Mark Produce.—Advertisements of National Mark beef and eggs were published in various newspapers, trade papers and women's journals during the month.

Use of Home Produce in Hotels and Restaurants.—Encouraging developments for home agriculture were foreshadowed on February 2 in the course of a Conference which the Minister of Agriculture, Sir John Gilmour, and the Parliamentary Secretary, Lord De La Warr, had with proprietors and representatives of hotels, restaurants, etc., and other large catering establishments, including railway and shipping companies, on the subject of the greater use in their businesses of home-grown foodstuffs. The interests represented were purchasers of foodstuffs to the value of many millions sterling per annum.

The Minister emphasized how important it was that a lead should be given in the greater use of home-grown supplies. The representatives present expressed their wholehearted sympathy with the policy of purchasing the products of this country, and stated that they had, in the past few months, substantially increased the proportion of home supplies purchased. Their use of home produce was, in fact, only limited by the extent to which it was available in good condition, properly graded and packed, in adequate and regular supply, and at competitive prices.

After a full discussion, the following Resolution was unanimously agreed :—

"This Conference of representatives of the hotel and catering trades and shipping and railway interests expresses its readiness to use home produce to the fullest extent practicable. It stresses the importance of bulk and regular supplies of carefully graded produce, and welcomes the efforts of the Ministry of Agriculture to develop home production and, through the National Mark, to secure standardization of quality and pack of home-produced goods, and improved organization for selling. The Conference is unanimous as to the vital necessity of standardization and organization if the home producer is to turn to good account the favourable opportunity for increased business which is now presented to him. The present goodwill of buyers and of the public towards the home producer will not endure unless steady and adequate supplies of high quality produce attractively presented at competitive prices are forthcoming from home sources."

The opinion was expressed that the presentation of home-produced chickens was not equal to that of the Continental product, and Sir Francis Towle suggested that changes might possibly be made in fattening methods as well as in the grading and preparation of chickens for market. He suggested also that English cheese-makers should turn their attention to the manufacture of certain popular varieties of soft cheese, such as Brie and Camembert. The public were at present going without these soft cheeses from patriotic motives, but they could not be expected to do so indefinitely.

As regards meat, several speakers agreed that it would be possible to use much more mutton, lamb and veal in their businesses if these were produced to the required sizes and qualities. They stressed the fact that they could use large quantities of milk-fed lamb in the first three months of the year if supplies were forthcoming. There was also a need for supplies of white-fleshed veal, sweetbreads, etc., of the type now produced in large quantities on the Continent.

Mr. Arthur Towle mentioned that, in this respect, English veal was at present so unsatisfactory that the L.M.S. Railway Company had been compelled to discontinue its use in their catering services. Others present concurred in this criticism.

A consideration of fruit and vegetables revealed that supplies of graded English apples and pears—particularly pears—are entirely inadequate for the needs of the trade. As regards

early vegetables, there was great difficulty in getting suitable supplies from this country during the first three months of the year, and, when supplies were forthcoming, they were frequently ungraded.

Mr. Clements (Messrs. Spiers & Pond) criticized the suitability of English canned fruits and vegetables for use by the catering trade. Various members testified to the high quality of the English National Mark pea pack this year, and to that of a number of varieties of soft fruit, but pointed out that more uniform grading was required as regards cherries. Canned beans were not available either in regular supply or in sufficiently large quantities; and of tomato purée, used in hotels, etc., in large quantities, very little was made in this country.

The need for improved transport and distribution for English supplies was emphasized by Mr. V. Joseph of Messrs. J. Lyons & Co., Ltd., who mentioned, amongst other points, the great difficulty his firm had in dealing with returned empties.

As a result of further discussion, it was decided to set up a small Committee of the Conference to confer with representatives of producers (such as the various National Mark Trade Committees) and the Ministry as to the methods that could be adopted to meet the requirements of large-scale consumers from the resources of this country. It was also agreed that a questionnaire should be prepared and issued by the Ministry to leading catering establishments, in order to ascertain more specifically the requirements of the trade.

A committee of the Conference has now been formed for the purpose of conferring with the representatives of producers and of the Ministry, and is constituted as follows:—

SIR FRANCIS TOWLE, C.B.E.	Gordon Hotels, Ltd.
MR. G. REEVES-SMITH	Savoy, Claridge's and Berkeley Hotels.
MR. ARTHUR TOWLE, C.B.E.	L.M. & S. Hotel Services.
MR. R. C. VAUGHAN	Honywood Hotels, Ltd., and other Hotels.
MR. T. A. CLEMENTS	Messrs. Spiers & Pond, Ltd.
MR. V. JOSEPH	Messrs. J. Lyons & Co., Ltd.
MR. W. G. INGLIS	Orient Steam Navigation Co., Ltd.
MR. A. G. CHIFFERIEL, F.C.A.	Hotel & Restaurants Association of Great Britain.
A Representative of	The Incorporated Association of Purveyors of Light Refreshments.

Graded Poultry at the Bath and West Show.—A welcome and appropriate innovation has been made by the Bath and West and Southern Counties Society in the Schedule for their

forthcoming Show at Yeovil on May 25-28. In the Dead Poultry Section, it is specified, in classes 79 and 80, that competitors should submit market packs of six graded cockerels and six fat ducklings, respectively, the exhibits to be packed in standard packages.

It is encouraging to find the oldest agricultural society in the country taking the lead in recognizing up-to-date marketing methods by introducing, for dead poultry, classes that are on the lines of the requirements of the National Mark Dressed Poultry Scheme. It is to be hoped that other societies will give practical support to the movement by introducing similar classes into their schedules.

The Bath and West Society have also this year introduced a special class for bottled cider bearing the National Mark.

The "National Mark" and Titles of Companies or Societies.—With the growth of the National Mark Scheme and the increasing demand for National Mark produce, the sales value of the words "National" and "National Mark" is becoming widely recognized. This has led to a growing tendency for companies and societies to wish to use, in their business descriptions or advertisements, words that convey the suggestion that the goods they sell are of National Mark quality. The use of such descriptions is to be deprecated, as they are misleading.

The registration of the "National Mark" as widely as possible under the Trade Marks Acts, as the mark of the Minister of Agriculture and Fisheries, has safeguarded the Mark from improper use in other ways. Arrangements have now been made with the Registrar of Companies and the Registrar of Friendly Societies that all future applications for registration shall be scrutinized with the object of avoiding the misleading use of the words "National" or "National Mark" in the names of companies or societies, particularly those engaged in the marketing of agricultural or fishery produce or in any kindred trades.

Sugar Beet.—*Sugar Production*, 1931-2.—According to the returns made by the beet-sugar factories operating in Great Britain, the total quantities of beet sugar manufactured during January, 1932, and the corresponding month in 1931 were :—

January, 1932	102,029 cwt.
January, 1931	1,380,916 ,,

The total quantities of sugar produced during the two manufacturing seasons to the end of January were :—

1931-2	5,026,266 cwt.
1930-1	8,371,496 ,,

The quantity for 1931-2 represents the total production for the season. In 1930-1, 114,469 cwt. were produced during February, 1931, making the total production for the season 8,485,965 cwt.

Beet Prices, 1932.—The 13 factories affiliated to the Beet Sugar Factories Committee of Great Britain (*i.e.*, all factories except the five comprising the Anglo-Dutch group) recently agreed with the National Farmers' Union the terms of their beet contracts for 1932. In the case of eight factories, the basic price is 40*s.* per ton for beets of 15½ per cent. sugar-content, but as regards the remaining five factories, which are less favourably situated, the basic price is 2*s.* per ton higher. In all cases, provision is made for the payment of an additional 1*s.* 3*d.* per ton of beet for every 1*s.* by which the price per cwt. of raw sugar plus the amount of assistance approved by the Government exceeds 22*s.* The variation in price for differences in sugar-content is at the rate of 2*s.* 6*d.* per ton for each 1 per cent. above or below 15½.

The terms of the contract offered by factories in the Anglo-Dutch group provide that the "whole net proceeds" from products manufactured at the factories are to be apportioned on the basis of 80 per cent. to the grower and 20 per cent. to the factories until the return to the grower reaches 45*s.* per ton of beet of 15½ per cent. sugar-content, and thereafter 50 per cent. to each party. The "whole net proceeds" are to be determined by adding to the gross receipts for manufactured products any unconditional State assistance and then deducting (*a*) manufacturing and establishment charges and beet expenses, (*b*) selling expenses and Excise duty, (*c*) interest on working capital provided by the factory through its bankers, and (*d*) net increments paid to growers, at the rate of 2*s.* 6*d.* for each 1 per cent., in respect of sugar-content in excess of 15½ per cent. No deductions are to be made in respect of depreciation, directors' fees, additions to plant and buildings, dividends or reserves. The grower is guaranteed a minimum price of 35*s.* per net ton of beet (delivered) of 15½ per cent. sugar-content.

A Dominion Mark for New Zealand Fruit.—The compulsory use of standard grades and packs in conjunction with an export mark has been in force for New Zealand fruit for export

for some years. There has recently developed a demand for similar measures of standardization for the internal trade of the Dominion. In consequence, the New Zealand Fruit Growers' Federation, which is a national body representing all the local fruit growers' associations, has organized a scheme for the application of a Dominion Mark to graded fruit for sale in New Zealand. The scheme will come into operation for the present season's crop. Grading and packing standards have been, or are being, worked out for all kinds of fruit, including apples, pears, peaches, nectarines, plums, apricots and cherries, and the question of including grapes is being considered.

In defining these standards, the New Zealand State Horticultural Department and advisory committees of fruit growers in the various provinces have co-operated with the Federation. With regard to apples and pears, the grades and methods of packing adopted will conform generally to those laid down in the export regulations.

The mark, which has been registered by the Federation as a trade-mark, is not the same as that used for export. Attractively coloured labels, printed with the Mark, are issued to fruit growers for application to packages of fruit packed according to the Federation's standards. One of these labels is reproduced opposite; the spaces provided are for the name of the fruit and its grade.

Great stress is laid upon the necessity for ensuring to the trade an adequate supply of Dominion Mark fruit, and with this object growers are being asked to contract to market an agreed proportion of their output under the Mark for two years. The response of the growers to the scheme has been highly satisfactory.

To add force to the guarantee of quality provided by the Mark, it is hoped that the inspection of Dominion Mark packs will be carried out by the State.

The Federation is giving special attention to publicity for the Mark, both among consumers and distributors. In the daily Press, 5-column illustrated advertisements, 16 in. in depth, are being inserted displaying the Dominion Mark and explaining its purpose. Posters and window bills are being issued to retailers for shop display, and the possibility of supplying Dominion Mark price tickets is being considered. A special endeavour is being made to interest the Chinese fruiterers, who form an important section of the retail fruit trade of the Dominion, by the distribution to them of a circular printed in Chinese, setting out the advantages of the Mark as a guarantee of quality. Both auctioneers and retailers have received the scheme favourably and are supporting it strongly.

In drawing up this scheme, the New Zealand fruit industry has undoubtedly been influenced by the success of the National Mark Scheme in this country. Thus, the *Orchardist of New Zealand* in its issue of December 1, 1931, states: "Given enthusiasm among the growers, we are confident that the Dominion Mark scheme will be successful from its very inception, and that as experience is gained it will go on from success to success as the English scheme has done."

It is interesting also to note that a suggestion has recently been advanced that the New Zealand Government should call a conference of primary and secondary producers to consider the adoption of a single, State-controlled national mark for all New Zealand products to replace the numerous marks that are now used.

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The New Zealand Dominion Mark for Graded Fruit sold in the Dominion.

To face page 1252.

NOTES ON PRICES AND SUPPLIES*

R. J. THOMPSON, C.B., O.B.E.

PRICES during the past four weeks have been sluggish and very little change has taken place in ordinary agricultural produce, except in the case of milk, for which the revised contract terms for February are 1*d.* per gallon less than in the same month of 1931. Wheat, barley, oats, cheese, potatoes and wool remain at or above the level of a year ago, but most other commodities are decidedly lower. Among feeding stuffs, comparison with February, 1931, when prices were almost at their lowest point, shows an appreciable rise in the case of feeding barley, oats and wheat offals; maize and maize meal have changed but little, while linseed cakes are somewhat cheaper than at this time last year.

	February, 1932		*January*, 1932		*February*, 1931	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
Wheat, *Gazette* average, per cwt. ..	5	7	5	10	5	2
,, No. 2 Manitoba, ,, ,, ..	7	0	7	1	6	0
,, Argentine, ,, ,, ..	6	1	6	3	4	11
Barley, *Gazette* average, ,, ,, ..	8	3	8	2	8	5
Oats, ,, ,, ,, ,, ..	7	3	6	11	5	10
Fat cattle, first quality, ,, ,, ...	45	7	45	7	48	3
Beef, English N.M. Prime, per lb. ..	0	7½	0	7¼	0	8
,, Argentine chilled, H.Q. per lb. ..	0	5¼	0	5⅝	0	5⅞
Fat sheep, first quality, per lb.	0	9½	0	9¾	1	0¾
Mutton, English, per lb.	0	8⅛	0	8¼	0	10⅝
Lamb, New Zealand, per lb.	0	7¼	0	7¾	0	8½
Bacon pigs, first quality, per score ..	10	3	10	2	14	2
Bacon, British green, per cwt.	86	0	86	0	102	0
,, Danish ,, ,, ,, ...	56	0	56	0	66	0
Pork pigs, first quality, per score ..	12	6	12	9	17	5
Pork, English, per lb.	0	7½	0	8¼	0	11¾
Butter, farm, per lb.	1	6¼	1	7	1	7½
,, New Zealand, per cwt.	107	0	107	0	122	0
Cheese, Dairy Cheddar, per cwt. ..	112	0	110	0	94	0
,, New Zealand, ,, ,, ..	64	0	61	6	56	0
,, Canadian ,, ,, ..	75	6	74	0	82	0
Eggs, N.M. Standard, per 120	13	3	17	9	16	9
Potatoes, King Edward, Lincs and Yorks, per ton	230	0	280	0	150	0
Wool, Southdown, per lb. (at Bradford) ..	1	1½	1	1½	1	0

The rates quoted are those reported by the Ministry of Agriculture as prevailing during the week ending February 10, 1932, and in corresponding weeks, a month and a year earlier. Except for fat stock, wheat and wool, the prices are those recorded for first quality at London markets.

A question of interest at the moment is—what is likely to be the effect of the revenue tariff on the prices of home produce? It is sometimes assumed that the whole of the

* Written mid-February.

tax will simply be added to the price of the imported articles and that this will cause a proportionate rise all round. This, however, seems an undue simplification of a complex question. Where a customs and excise duty is applied to the whole of the supply, both home and imported, as for example in the case of sugar, the price is, of course, raised by the amount of the tax, but where, as in the case of the new tariff, the tax is applied only to part of the imports, the price is presumably settled by competition between these imports and that portion of the total supply, whether home or imported, which is free of duty. If the portion of the total supply which is subject to tax is very large, the price would be increased practically by the amount of the tax, because there would be little competition from tax-free supplies. If, on the other hand, the portion of the supply which bears the duty is small, as in the case of flour, competition would prevent any material increase, this portion of the supply being, in fact, in the same position as if there had been an addition to the cost of freight or some other charge which made it more expensive to put these particular goods on the British market. If this interpretation of the effect of the duty is correct, it follows that its influence on prices is likely on the average to be roughly proportionate to the size of the foreign imports in relation to the home supply and to the supply from the Dominions.

This, however, only applies to products of a fairly analogous character. Where the exports of a foreign country consist of articles of some particular grade or quality for which there is a demand, and for which no very effective substitute is available, then the whole of the tax may be added to the price, as competition is practically absent.

Another aspect of the question is that agricultural imports are frequently dependent not so much on price as on seasonal production in exporting countries and on the existence or otherwise of alternative markets. The imports of bacon into the United Kingdom, for example, in 1931, were 21 per cent. greater than in the preceding year, but this was not due to any attractiveness in the way of price—quite the contrary—but to the fact that pig production in Europe having been increased, as a consequence of cheap feeding stuffs, large supplies of bacon were being produced for which no other market than Great Britain could be found.

Butter is another instance, and maize is a third, of heavy imports resulting from a favourable season arriving in in-

creasing quantities on a falling market. There is little doubt that a considerable proportion of the imports of these and other products have of late been sold to this country at very unremunerative rates merely because there was no other outlet for sale. Where this condition of affairs exists, a tax on importation may be counterbalanced or partly counterbalanced by a reduction in price in the country of origin in order to avoid the check to sales which might follow a rise in the wholesale prices in this country. This is no more than an aspect of ordinary competition, and, quite apart from excessive supplies, it seems probable that foreign countries may, in many cases, be forced to make concessions in order to retain their trade as against the Dominions. Certainly, foreign countries, and particularly countries on a gold basis, will be less easily able to compete with the Dominions, and exports from the latter are consequently likely to be stimulated.

On the whole, whilst it would be unwarrantable to expect that the revenue tariff will raise home prices in all cases by the full amount of the tax, it is bound to have an upward effect, and it comes at a time when other influences, such as the change in the currency, are also operating in the same direction. It has, however, to be remembered that, in a normal year, seasonal fluctuations of 10 per cent. in the price of many commodities are in no way unusual, while variations from one year to another are frequently greater, so that the effect of the duty may easily be obscured by causes in no way connected with it.

Wheat.—Wheat prices have fluctuated within narrow limits in the past four weeks, but were somewhat firmer in the middle of February, when the Liverpool March future stood at 5*s.* 6*d.* per 100 lb. as compared with 5*s.* 1*d.* a month earlier.

The prospects of Continental buying have improved, as Italy has increased the quota of foreign wheat allowed in milling to 30 per cent. for soft wheat and 80 per cent. for hard wheat, proportions which will permit the importation of several additional million quarters in the next few months. In addition, there is the probability that these proportions will be further increased before the end of the season. France has also raised its quota of imported wheat from 3 to 20 per cent., while the available statistics suggest that larger purchases by Germany will be necessary shortly. Countries outside Europe have been buying on a liberal scale, and the shipments, recorded by the *Corn Trade News* up to February 9,

amounted to 12,932,000 quarters against 10,434,000 quarters last season. If this movement is maintained and European buying improves, it should result in an advance in prices.

Information as to the area sown with winter wheat is necessarily of a very preliminary character, but so far as it goes it indicates, according to the International Institute of Agriculture, a net reduction in the Northern Hemisphere (including Russia) of about 4,000,000 acres. The condition of these growing crops, up to the middle of February, was generally normal, though the United States winter wheat crop appeared to have suffered some slight damage by frost.

The revenue tariff on wheat flour will affect imports from France, the United States and Argentina, from which countries 3,800,000 cwt. were imported in 1931 : this, however, only represents about 4 per cent. of the total supply, the bulk of the flour consumed being milled in this country. The imports from Australia and Canada amounted to 6,450,000 cwt. and it is noticeable that receipts from Australia have increased rapidly in the past two years from 1,332,000 cwt. in 1929 to 2,560,000 cwt. in 1931, whereas imports from the United States have been declining and from Canada they were less in 1931 than in 1930.

Cattle.—The slump in fat cattle, which occurs with remarkable regularity every autumn as a result of the over-supply of grass-fed cattle, is normally followed by a recovery in the following spring. Prices this year have conformed to the usual trend and showed early in February an increase of 2*s.* per cwt. as compared with November last. The present first quality average of 45*s.* 7*d.* per cwt. is, however, lower than it has been in any February since the War, and to bring prices up to the level which was reached in June last a gain of some 5*s.* 6*d.* per cwt. in the next few months is required. This is much more than has occurred in recent years, with the exception of 1928. On that occasion, prices that had fallen in the preceding November to the abnormal level of 45*s.* 8*d.* per cwt., rose rapidly in the spring and reached 63*s.* 4*d.* in June. This seems to have been due to a shortage of supplies, fewer cattle having been bought for yard feeding, while the termination of the so-called Argentine meat-war and somewhat reduced imports also had some effect. Such indications as exist rather suggest that home supplies this year also may be on the light side : both the number of fat cattle shown at markets and the numbers imported from Ireland have so far been rather less than in the past two years. On the

other hand, the Argentine position is not altogether favourable; it is true that killings, in 1931, were on a reduced scale, and that shipments of chilled beef to this country are no higher than last year, but prices in Argentina for good steers, suitable for chilling, have fallen by 20 per cent. since the summer, and there are evident signs of over-supply. Better prices in this country would, therefore, be likely to attract larger quantities of chilled beef. Imports in January from all sources amounted to 712,000 cwt. as against 783,000 cwt. in the same month last year. The supplies offered for sale appear more than equal to the demand and prices are low.

Another point, which may be mentioned in connexion with future prices, is the relation between the prices ruling in May and June and those in the following November. There is always a drop for fat cattle in this period of 5*s*. per cwt. and upwards—last year it amounted to about 7*s*.—so that unless prices recover this coming summer to approximately last year's level, there is the risk that the year 1932 may see even lower prices in the autumn than was the case in 1931.

Veal calves show a seasonal tendency similar to fat cattle, being high in the spring and low in the autumn, and, in 1931, prices fell in October and November to about 11¼*d*. per lb. Since then, there has been a recovery to 13*d*. per lb., but this compares with 13¾*d*. in February, 1931.

Sheep.—Fat sheep prices continue exceptionally depressed, and early in February average rates for Downs and Cross-breds were only 9½*d*. per lb. compared with 12¾*d*. in February, 1931, and 14½*d*. on the average of the preceding five years. Home supplies are normal for the time of year, but imports of frozen lamb continue at a high level, and the prospects of the seasonal rise in prices, which should occur in March, April and May, are very uncertain. Last year, in consequence, apparently, of the heavy supply of frozen lamb, there was very little perceptible rise in the spring, and the trend this year is probably dependent on the supplies received from overseas in the next few months. On the whole, these seem likely to be somewhat below last year's figures, although much higher than in 1930.

Imports of frozen mutton and lamb in January were in fact lighter than the very heavy imports of January, 1931 (538,000 cwt. as against 584,000 in 1931 and 311,000 cwt. in 1930). Both in Australia and New Zealand, the season began earlier than usual, and, in the case of New Zealand, it is expected that the later killings will be correspondingly reduced, the aggregate for the season being perhaps slightly higher

than last year. From Argentina, the shipments during the first seven weeks of this year have been much smaller (783,000 carcasses against 1,123,000 carcasses in 1931).

Pigs, Pork and Bacon.—The increase in the number of breeding sows, which was shown by the Agricultural Returns to have taken place between June, 1930, and June, 1931, has naturally led to a larger supply of fat pigs being marketed. Figures of the total killed are not available, but the numbers on offer at the principal markets, which are indicative of the general trend, showed an increase of 12 per cent. in the past year; while, since September last, the numbers have been over 20 per cent. higher than in the two preceding years. Store pigs have been in even larger supply, the increase since September being about 30 per cent. In past years, when the stock of breeding sows has risen to high figures, the resulting large supply of fat and store pigs has been the principal factor in the fall in prices which has inevitably followed. This cause is largely responsible for the present depression, which, however, has been made more severe by the fact that these large supplies of home-produced pigs have synchronized with heavy imports of bacon. Any material improvement in the present low level is dependent on a more moderate supply from one or both sources. As regards home production, this has for many years shown a cycle of more or less regular fluctuations, and, judging by past experience, it seems likely that supplies will continue to be relatively heavy for some months to come, but a gradual falling off in the output, particularly of pork pigs, is to be expected, and this should lead to better prices in the autumn. This, of course, is on the assumption that the normal trend is not modified as a result of some exceptional steps being taken in connexion with the bacon industry.

As regards bacon imports, there seems reason to believe that these will also show a reduction in the second half of the year, as the Census returns in several European countries suggest that the peak of pig production is now past, and that breeding is not keeping pace with the killing of older pigs. In Denmark, which is the principal contributor to the British market, the pig population in January, 1932, was estimated at 5,487,000, which was slightly above the figure for the previous June and the highest ever recorded. The figures, however, seem to indicate that breeding is on the decline, as the number of pregnant sows has fallen since last July from 430,000 to 355,000, and is smaller by 30,000 than it was in January, 1931. The number of young pigs under two months is

also lower than in July last, the increase being in pigs above that age. A somewhat similar indication of a reduction in breeding is seen in Holland, where the number of sows covered was estimated in December last to be only 88 per cent. of the number in June, 1930, while the number of young pigs was 18 per cent. down. In Sweden, the position is much the same, as there has been a reduction in the number of sows although the total pig population in September last was 2 per cent. higher than a year earlier. Germany is an importing rather than an exporting country, but it shows the same characteristics of a large total pig population with a reduced number of sows. In Poland, which, in 1931, was the second largest contributor of bacon to this country, the number of pigs recorded in June last was 21 per cent. above 1930 and 50 per cent. higher than in the previous year, but no later information is available to show whether the increase is continuing. The development in the export of bacon from Poland has been noticeable, 1,076,000 cwt. being exported in 1931 as against 483,000 cwt. in 1930. This has been partly due to the large supply of pigs, and partly to the fact that Germany and Czecho-Slovakia, which formerly took large supplies of live pigs from Poland, have practically closed their markets by high tariffs and other measures, thus forcing Poland to develop the export of bacon to the British market.

Butter.—Although farm-house butter has to some extent a market of its own, and prices vary seasonally with production, the general level is influenced by the prices obtainable for imported grades. Danish butter, for example, on the London market, showed an average decline, between 1929 and 1931, of 29 per cent., while farm-house butter fell in the same period by 23 per cent. The tariff should assist prices to some extent, although European exporters will no doubt make great efforts to avoid losing any part of their trade. Of the total supplies, 46 per cent. (4,071,000 cwt.) came, in 1931, from foreign countries, and about the same quantity from Empire countries (4,000,000 cwt.); the size of the home-produced supply at the present time is not known, but, in 1924, it was estimated at only about 850,000 cwt.

The extent to which butter imports have increased in recent years may be judged from the fact that receipts in 1931 were 18 per cent. greater than the total for 1930, and no less than 53 per cent. above the figure for 1924. Consumption has, of course, correspondingly increased, being, in 1931, about 20·6 lb. per head as compared with an average of 15·6 lb. in the four years 1924–27.

Heavy supplies seem likely to continue for the present. Production in the Southern Hemisphere, aided by favourable weather conditions, has achieved a record output; Australian production in the seven months since last July has been 44 per cent. greater than in the corresponding period of 1930–31, while the New Zealand output has been 7 per cent. greater. Production, though now declining, continues on a higher level than a year ago. There is the possibility also of larger supplies being directed to this country from the Continent, owing to the fact that tariff restrictions in Germany make that market less attractive than formerly.

Cheese.—Only about one-fifth of the cheese consumed in this country is home-produced, and each of the many varieties meets to some extent a special demand, so that prices, especially for best-quality produce, are largely dependent on variations in production from one year to another. Cheshire cheese is an outstanding example of this at the present time, when, owing to a reduced output, prices are higher than any recorded for some years past. Dairy cheddar is also fetching better prices than at this time last year, and approximately the same as in 1930, notwithstanding the fact that both Canadian and New Zealand cheese are about 25 per cent. cheaper. These imported varieties have, in fact, more influence on the poorer qualities of farm cheese and on factory cheese than on the high-grade matured English cheese, for which, if the supply is moderate, there is always a steady demand.

Empire supplies will not be affected by the revenue tariff, and these account for 87 per cent. of the total imports (2,523,000 cwt. out of 2,885,000 cwt. in 1931). Of the remainder, supplies from Holland (168,000 cwt.), Italy (132,000 cwt.), Switzerland (32,000 cwt.) and France (12,500 cwt.) were of most importance. Cheese from Holland consists mainly of the Gouda and Edam varieties, from Italy of Gorgonzola and from Switzerland of Gruyère, but cheese of the Cheddar and Cheshire types is also received as well as prepared or processed cheese. In these latter cases, the tariff should be of assistance to British cheese makers.

Milk.—The imports of milk into this country come mainly in the form of condensed milk, but there is also an increasing supply of milk powder, together with some cream and fresh milk. The quantities received, in 1931, from the Empire and from foreign countries were as in the table (p. 1261).

	From the Empire	*From foreign countries*
Condensed milk :	cwt.	cwt.
Sweetened whole	11,200	218,500
Sweetened skimmed . .	38,900	2,049,000
Unsweetened	34,500	448,600
Milk powder	152,000	200,600
Cream	71,900	100,200
Fresh milk	69,700	13,500

There are no recent figures of the home output of condensed milk, but, in 1924, it was estimated at 783,000 cwt. ; if the present output is not materially different, this would be about 28 per cent. of the total import of 2,800,000 cwt. in 1931. As only a small proportion of the latter comes from Empire countries, the tariff should be of benefit to condensed milk factories in Great Britain, and thus help to absorb some of the surplus milk supply. This should also be the case with foreign cream, which comes largely from Denmark and Holland. The imports of foreign fresh milk shown above were all received in November and December last as a consequence of the temporary milk shortage ; in the two preceding years there were no foreign imports.

Eggs.—Owing partly to the favourable season, home-produced eggs have been in ample supply and the usual seasonal fall in prices has been proceeding rather more rapidly than usual. National Mark Standards, for example, early in February, were realizing 13*s.* 3*d.* per 120, whereas, in 1931, this figure was not reached till three weeks later. Imports in January were only 1,373,000 great hundreds, as against 2,079,000 in January, 1931, but this decline was probably only temporary.

It is estimated that the production of eggs in the United Kingdom, in 1931, amounted to 29 million great hundreds, which was more than half the total supply, the imports amounting to nearly 26 million great hundreds. Of these imports 19¾ millions, or 76 per cent., came from foreign countries, and on these the new tariff should have some restrictive effect, though any decrease in the supply from abroad is likely to be more than made up by the increase in home production. The bulk of the Empire supplies comes from the Irish Free State (4,575,000 great hundreds in 1931), and these have tended rather to decline, but Australia has, of late, shown a marked development, and imports in the past year amounted to 914,500 great hundreds as compared with 554,600 in 1930. Supplies from South Africa (589,000 great hundreds) also showed an increase in 1931, although towards

the close of the year shipments were reduced owing to unfavourable exchange rates obtained by exporters as a consequence of South Africa remaining on the gold standard. To compensate for this, an export subsidy of 3*s.* 6*d.* per case of 30 dozen eggs has been granted, but the shipping season is now over for some months.

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MARCH ON THE FARM

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Arable Land.—This month is a time of notable activities on arable land. Much of the success of spring-sown crops is dependent on favourable weather conditions this month. The value of March dust is proverbial. Seeding of cereals should be done at the first favourable opportunity. It ought not to be necessary to emphasize that the opportunity should be favourable, since practical farmers recognize the importance of tilth or season at seeding time, these two factors having a very definite influence on subsequent growth. Small seeds and shallow-rooted crops in particular must have good soil conditions to ensure success. The advantages of a good tilth and timely seeding are both direct and indirect. Full growth on any particular soil is dependent on weather conditions, food supply and water supply, the last two of which are influenced by soil texture and tilth.

Weather conditions are not under control, but the soil texture and the plant food supply available, if favourable, can do much to mitigate the effect of adverse weather conditions. In addition to the factors already mentioned, pests —whether of a fungus or insect character—may materially influence crop yields. All cultivated crops are liable to such attacks, and with insect pests in particular the time when damage is being done is not always the time when control measures can be economically practised. Pests on valuable crops like fruit may often be dealt with by direct measures when the trouble arises, although in many cases earlier treatment to prevent attack may have been possible and advisable.

Insect attacks on ordinary farm crops are difficult to combat once the attack has developed, although in recent years a considerable measure of success has followed the use of poisoned bait for grubs and contact powders for slugs.

Two pests very well known to the farmer are wireworm and frit fly, each of which causes enormous damage. In such cases preventive measures are more effective than any known

method of direct treatment. Frit fly usually hatches out in the south in the early part of May, and oats are the principal cereal attacked. The stage of the oat crop at the time the insect hatches out is important; oat plants that have not advanced beyond the seedling stage are most liable to attack. Stimulating manures may help the plant to grow away and the damage may be mitigated, but there are real advantages in early sowing on a good tilth, with adequate manuring to push on growth. What are termed in the south "Cuckoo Oats," that is, oats sown after the arrival of the cuckoo, seldom give satisfactory results.

Wireworms are perhaps the greatest single nuisance of the arable farmer in the south. As with other insect and fungoid pests, some years are worse than others, but as it is impossible accurately to forecast whether wireworm will do severe damage or not, the fight against them, so far as preventive measures are concerned, has to be continuous. In this respect clean land and adequate cultivation play a large part. It is well to have this in mind now, as it is small consolation to be told in May when wireworms are destroying the mangold and beet that an extra ploughing in winter or more cultivations in spring would possibly have prevented the attack—by reducing the numbers of surviving wireworms, and, more probably, by creating better conditions for the growth of the crop.

The "seedling stage" is the most critical period.* Firmly-rooted plants in full growth suffer little and usually outgrow the attack. The young plant should therefore be given every facility to get quickly away from the seedling stage. This is done by "good farming"—in other words, by providing an adequate supply of plant food and a suitable seedbed. Manuring is perhaps the more easily controlled of the two. Readily-available supplies of phosphate are important in order to develop roots and push the plant through its seedling stage. Light dressings of nitrogenous manures may also be helpful, but it should be noted that these are mainly effective in creating a more vigorous growth and inducing the plant to make more leaf: the actual stage of growth may not be advanced, and in this respect the dressings are better for helping the plant after an attack, rather than effective in pushing it

*The Frit Fly begins to emerge in the early part of May, but the main emergence takes place after the middle of the month; it is desirable that oats should have reached the stage at which they have four leaves in addition to the central infolded leaf before May 21 or thereabouts.

to a stage when it can resist attack. Given the requisite supply of plant food, then the physical texture of the soil must be considered. The texture of the seedbed, and to some extent the manuring, must be controlled with due regard to the type of soil.

Autumn-sown cereals, especially on heavy land, do not need so good a seedbed as spring-sown crops, since they become established at a time when they are less liable to wireworm attacks. They are not subject to drought, and heavy winter rains have an adverse effect if the tilth is too fine. Spring sowing is done at a more critical time, when skill in cultivation counts.

The preparation of a seedbed must be regarded as an insurance, and the assumption that there will be no insect attack on the crop is an unjustifiable risk. An extra cultivation or two, though costing a little more, is a good investment. A partial crop means almost as much subsequent expense in harvesting and threshing, and is also apt to leave a dirty field.

Grass Land.—All treatment of grass land by harrowing or cultivating should be completed as soon as possible, and fields where early grass is desired should be free of stock. On selected fields where early grass is desired no time should be lost in applying fertilizers, if such are required.

The summer of 1931 proved to be an exceptionally good grass year over the greater part of England, at least so far as quantity was concerned, and farmers who had difficulty in getting the grass fed off in autumn may find it advantageous to stock any rough fields a little heavier than usual in the early spring months and get the new and old grass fed off together. A few roots in addition will allow of this being done without injury to the stock, and the result will be a material benefit to the pasture and lead to better quality herbage during the remainder of the season.

At this period of the year there is considerable controversy as to the merits of the roller as a means of improving the pasture. The type of soil and the local conditions must determine whether rolling will be an advantage or otherwise. Fields that are to be mown for hay are usually rolled primarily to level obstructions and make work easier and safer for the mower. On land to be fed by stock there would appear to be a real need for discretion as to rolling.

On heavy land rolling under wet conditions can be positively harmful, and under dry conditions has very little effect. On light land rolling is very necessary, and can be done with

advantage several times during the summer. The need for summer rolling is particularly noticeable on any poor, light soil where the stock-carrying capacity is small and the amount of treading by stock is consequently insufficient. The condition of the grass on and adjoining footpaths in fields is an indication of the benefit that may be obtained from treading or rolling. White clover is much increased by rolling during wet periods in summer; the young runners are pressed down to the soil and are thus enabled to take root and spread more freely.

Live Stock.—Dressing of cattle to destroy warbles should be commenced this month. It has now been so clearly proved that dressing the warbles on the backs of cattle with derris powder preparations is both easy and effective that stock owners have no excuse to neglect this work. If such dressings were universally adopted much loss that is now caused by cattle "gadding" in summer, and the damage to flesh and skins in winter, would be prevented.

Calf Rearing.—At this season of the year more calves are reared than during autumn and winter. Advantage is taken of the greater supply of milk that is usually available in late spring, and the season is also considered suitable in many districts as it permits some summer grazing for the calves. Breeders who rear heifer calves for the maintenance of their own herds will naturally make some selection as to the calves to keep. Purchasers of heifer calves have to bear in mind that the man who takes the most trouble and uses good bulls usually keeps the best heifer calves for his own use. Such a practice is to be commended and would appear to be the only way to ensure improvement in the stock of the country. On the other hand, there are many dairy farmers who confidently assert that they can maintain their herd better and more cheaply by purchase than by rearing. In certain circumstances this is true, and in consequence many dairy farmers follow this practice, buying really good cattle for their herd and selling the whole of their calves.

With such a practice the inducement to use a really high-class bull of milking pedigree is almost absent, and the more it is adopted the more difficult it is to raise the general level of the dairy cattle in the country. If these good cattle were mated to a really high-class bull, and the calves could find a remunerative market, a notable improvement in milking cows would follow.

It is an extremely wasteful practice to mate good cows with an indifferent bull merely because the breeder has a limited interest in the calves. If bulls of proved breeding merit were used in such circumstances a private trade in calves might be possible on terms that would be mutually beneficial to breeder and purchaser.

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NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
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Management of Farmyard Manure.—Those who are interested in the development and extended use of chemical fertilizers sometimes overlook the importance of farmyard manure in maintaining the fertility of our soils. How considerable this is may be seen by assessing the respective contributions of dung and artificials to an arable rotation in which fertilizers are used in ordinary amounts.

MANURING OF A FIVE-COURSE ROTATION

	Farmyard manure Tons	Sulphate of ammonia cwt.	Super-phosphate cwt.	Muriate of potash cwt.
Roots (potatoes, beet)	12	2	3	2
Barley	—	—	—	—
Clover	—	—	2	½
Wheat	—	—	—	—
Oats	—	1	1	½
	12	3	6	3

From the composition of the manures and the quantities used the following table may be derived.

LB. PER ACRE PER ROTATION

	Nitrogen, total	Nitrogen available	Phosphoric acid	Potash
From Dung	166	53	70	193
From Artificials	70	70	108	168
Total	236	123	178	361

In the above instance, the farmyard manure provides at least 70 per cent. of the total nitrogen, 43 per cent. of the available nitrogen, 39 per cent. of the phosphate, and 53 per cent. of the potash. There is no doubt that, in general, the part played by dung is considerably greater than this, for, on a large number of holdings, more dung and less artificials will be used per acre. An estimate, made in Denmark in 1929, shows the outstanding importance of farmyard manure in a country that also consumes large quantities of artificial fertilizers.

The dung was found to account for 84 per cent. of the total nitrogen, 54 per cent. of the phosphoric acid, and 90 per cent. of the potash used on Danish farms.

It is, perhaps, surprising that, in spite of the great importance of farmyard manure, it has been the subject of comparatively little experimental work. Many experiments compare the action of dung with artificials, in some cases over several seasons, but few exhaustive experiments have been designed to compare the field results obtained with dung made, stored or applied in different ways.

The best-known British experiments on these lines are those carried out by Professor Berry at the West of Scotland Agricultural College in the years preceding 1914.* At Rothamsted, also, in 1915–16, the losses of nitrogen under different systems of management, and the effect of the various manures on the first and second crops, were ascertained.†

Recently, the results of a long series of classical experiments, carried out during the period 1911–26 at Aarslev, in Denmark, have been made available‡ and a few notes on the arrangement and the main conclusions of this work may be of interest.

Two lots of dairy cows were fed on an equal ration of bulky fodder, one lot receiving ordinary cake feeding and the other heavy cake feeding. A strict account was kept of the quantities of food and litter used, and of the milk, urine and dung produced, as well as their composition in terms of nitrogen, phosphoric acid and potash. Arrangements were made in each case for separating the liquid manure from the dung and litter and collecting it in tanks, this being the common practice in Denmark. The dung was made and stored in different ways and used in a replicated series of rotation experiments on arable crops. The results were, therefore, measured in terms of the composition of the manure as well as by its crop-producing power over a series of crops. In every case, the dung and corresponding liquid manure were applied to the crops. Under the ordinary system of management, where about 2 lb. of litter per head per day was used, and almost all the urine was conducted to the tank, the loss of nitrogen from the solid manure was quite small, being only about 7 per cent.

Experiments with various quantities and types of litter showed that increasing the litter from 2 lb. to 11 lb. of straw

* W. of Scot. Agric. Coll., Bull. 65, 1914.

† *Jour. R.A.S.E.*, Vol 77, 1916, p. 1.

‡ K. Iversen: Dänische Versuche mit Aufbewahrung von Stalldünger, *Archiv für Pflanzenbau*, Vol. VI, 1931, p. 577.

increased the loss of nitrogen from the solid manure. This loss was further increased to 27 per cent. by allowing the liquid manure to percolate through the dung before draining off into the tank.

The addition of peat moss litter also increased the loss of nitrogen from the solid manure. In fact, any process that caused the liquid to be held up in the straw and dung instead of getting straight away into the storage tank was inferior to the standard practice. The loss of nitrogen was reflected in lower yields in the field. The conclusion was that only sufficient straw should be used for the comfort of the animals. If new straw, instead of being used as extra litter, was applied along with the dung in the field, considerable loss of crop resulted, an effect that has often been observed elsewhere.

Storage of the solid manure in loose and compact heaps showed that the loose heaps became hotter and lost more nitrogen, but the difference in crop-producing power between the two types of manure was, if anything, in favour of the loose-stored material.

Manure stored in the open gave as good results as that stored under cover, but lost rather more nitrogen. The advantage of covering the manure is that the drainings can be utilized, since they are not too dilute to handle.

In considering these results it must be borne in mind that the Danish system secures the most valuable part of the manure separately, and the remainder, being much more stable, is subject to quite small losses and can even stand looseness and exposure without coming to much harm.

In the British system, the litter holds much more of the liquid manure and consequently the losses are higher, but may be reduced by the plentiful use of litter and compacting the mass.

The paper is full of useful chemical data relating to the composition of manure, urine, drainings from dung heaps, etc., and the distribution of nitrogen between dung, milk, urine, and live-weight increase.

Winter Corn.—The top-dressing of winter cereals in the spring with some form of quick-acting nitrogenous manure is well established, but, nevertheless, there must be many farms on which it could still be practised with advantage. Thus, in the recent *Economic Survey of Hertfordshire Agriculture*,* based on data derived from the study of 320

*R. McG. Carslaw: *An Economic Survey of Hertfordshire Agriculture.* University of Cambridge: Farm Economics Branch Report No. 18.

farms selected at random, it was found that only 27 per cent. of the wheat-acreage and 34 per cent. of the oat-acreage was top-dressed with nitrogenous manure. Even allowing for a fair number of cases in which, owing to previous generous treatment or high condition of the land, top-dressing would be superfluous or risky, there must still remain a number in which a judicious application of nitrogenous manure would have been sound practice. The yield of the wheat crop was estimated as $3\frac{1}{2}$ qr. and that of the oat crop at just over 5 qr. over the whole acreage, so that nitrogen might still be expected to give an increase.

It is estimated that, when it is properly used, 1 cwt. of sulphate of ammonia, or its equivalent, will yield, on the average, an extra $4\frac{1}{2}$ bus. of wheat grain and 5 cwt. of straw. This is about the expectation; it may be exceeded or may not be attained according to a large number of circumstances of soil, season, and management. In recent years at Rothamsted, the figures have not been quite so large, amounting, on the average, to 3·0 bus. of grain and 5·3 cwt. of straw. On the other hand, there are many records of larger increases. Jealott's Hill experiments show 4·3 bus. of grain and 7·2 cwt. of straw per 1 cwt. of sulphate of ammonia equivalent; and the University of Leeds reports two experiments in which the average increase for 1 cwt. of sulphate of ammonia was 5·5 bus. of grain and 10 cwt. of straw per acre. In recent experiments at Cambridge, the increase in grain was at the rate of 4·9 bus. per 1 cwt. sulphate of ammonia. For oats, the usual increase is of the order of 7 bus. of grain and 6 cwt. straw.

The study of the effect of nitrogenous manure on cereals has been diverted in recent years to the question of the bearing of the time of application of the nitrogen on the final result. Most experiments show that in a humid climate such as ours we must confine our attention to spring dressings. It still remains to be decided whether they should be applied early in the spring, deferred till later in the season, or given as divided dressings at both periods. As with most agricultural questions, there appears to be no general answer, and a number of conflicting factors have to be taken into account in making a judgment.

The usual plan is to give the top-dressing as soon as the land will carry the manure distributor, which in practice is about mid-March. Investigations at Rothamsted and elsewhere have shown that earliness is not of itself necessary to

obtain good results from nitrogenous top-dressings. Thus, experiments are on record of top-dressing winter oats (two seasons) and wheat (five seasons), which show that, on the average, March dressings gave decidedly less grain but more straw than May dressings in equivalent amounts. The effect of nitrogenous applications must be considered in relation to the degree of development of the plant. Work at Cambridge leads to the view that nitrogen applied after March does not increase yield by increasing the number of ear-bearing tillers, but by increasing the size of the ears on tillers that were laid down before the dressing was effective. It is probable that very early dressings indeed are necessary to increase the number of early-formed tillers that will eventually carry grain. Hence the idea of two dressings, one to increase the tillers capable of bearing ears and a second to furnish the nutriment to enable those ears to attain full size. The precise time at which a dressing will work in one direction or the other, *i.e.*, to increase tillers or increase ear-size, will no doubt depend on local soil and seasonal considerations. Thus, in counts made at Rothamsted, neither March nor early May dressings markedly increased the number of ears, but the increase in yield was mainly due to an increase in ear-size. On the light soil of Woburn, however, nitrate of soda, applied as late as April 16, increased the number of ears, but a dressing applied on June 6 had no effect on the number of ears, only increasing the ear size. The final result in terms of yield of grain was the same at Woburn, in spite of the different reaction of the plants to the manure.

Although the above considerations are not yet thoroughly worked out, they have some bearing on top-dressing practice. In the first place, it is clear that there need be no concern if it happens that a top-dressing has not been applied at the usual early season. The later dressings seem to give at least as much grain per acre, although they may affect the plant in a different way from the earlier ones. If straw is required, the evidence is that the early dressings give it more abundantly, not through the extra tillers, which die back before maturity, but through greater number, weight and thickness of the ear-bearing stems. An extra 5 cwt. of straw per acre means the possibility of producing a further ton of dung, which is quite an appreciable advantage to place against the use of the nitrogenous manure. Unusually late dressings naturally affect the yield only slightly, but they may increase the protein content of the grain, as American workers have shown. They have no place in ordinary farming practice at present.

PRICES OF ARTIFICIAL MANURES

Description		Average prices per ton during week ended February 3				
		Bristol	Hull	L'pool	London	Cost per unit at London
		£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	*	8 16	8 16	8 16	8 16	11 4
,, ,, Granulated (N. 16%)	*	8 16	8 16	8 16	8 16	11 0
Nitrate of lime (N. 13%) ..	*	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	*	7 5*d*	7 5*d*	7 5*d*	7 5*d*	0 4
Sulphate of ammonia :—						
Neutral (N. 20·6%)	*	7 0*d*	7 0*d*	7 0*d*	7 0*d*	6 10
Calcium cyanamide (N. 20·6%)	*	7 0*e*	7 0*e*	7 0*e*	7 0*e*	6 10
Kainit (Pot. 14%)		3 16	3 9	3 0	3 6*g*	4 9
Potash salts (Pot. 30%) ..		6 1	5 14	5 1	5 11*g*	3 8
,, (Pot. 20%) ..		4 7	4 1	3 10	3 19*g*	3 11
Muriate of potash (Pot. 50%) ..		11 9	10 17	9 0	10 18*g*	4 4
Sulphate ,, (Pot. 48%) ..		13 12	12 19	11 15	13 0*g*	5 5
Basic slag (P.A. 15¾%)‖ ..		2 10*c*	2 0*c*	..	2 6*c*	2 11
,, (P.A. 14%)‖ ..		2 5*c*	1 14*c*	1 14*c*	2 1*c*	3 0
,, (P.A. 11%)‖ ..		..	1 9*c*	1 9*c*	..	..
Ground rock phosphate (P.A. 26-27½%)‖		2 10*a*	..	2 9*a*	2 7*a*	1 9
Superphosphate (S.P.A. 16%)	§	3 2	..	3 9	2 17*k*	3 7
,, (S.P.A. 13¾%)	§	2 17	2 9	3 3	2 12*k*	3 10
Bone meal (N. 3¾%, P.A. 20½%)		8 15	7 0	7 0	6 15	..
Steamed bone flour (N. ¾%, P.A. 27½-29¾%)		5 19*b*	..	6 0	5 5	..
Burnt lump lime		1 4*p*	1 2*l*	1 9	1 19*n*	..
Ground lime		1 9*p*	1 8*l*	..	1 18*n*	..
,, limestone		1 3*p*	1 4*p*	1 7*m*	..	..
,, chalk		..	1 4*p*	..	1 6*n*	..
Slaked lime		..	..	2 9	2 10*n*	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid; S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‖ Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2*s.* 6*d.* extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1*s.* per ton extra, for lots of 2 tons and under 4 tons 5*s.* per ton extra, and for lots of 1 ton and under 2 tons 10*s.* extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

g Prices shown are f.o.r. northern rails; southern rails, 2*s.* 6*d.* extra.

k Prices shown are f.o.r. northern rails; southern rails, 1*s.* 3*d.* extra.

l Prices for 6-ton lots f.o.r. Knottingley.

m In bags f.o.r. Liverpool. Fineness 45% through standard sieve.

n Carriage paid 4-ton lots London. In non-returnable bags, prices are 5*s.* per ton extra.

p Prices for 6-ton lots f.o.r. At Hull ground limestone 100% through standard sieve.

NOTES ON FEEDING

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Milk-Fed Lamb.—The report of the Conference held at the Ministry of Agriculture recently with representatives of big catering firms (see p. 1247) contains statements of interest and importance to those engaged in agricultural production. One of these statements has reference to milk-fed lamb. The caterers emphasized the fact that they could use large quantities of milk-fed lamb in the first three months of the year if supplies were forthcoming.

The demand for small joints and for fat lamb in particular has been growing steadily in the last few years, and it has gradually become more evident that the mutton of root-fed tegs is gradually becoming less popular. This applies especially to mutton from sheep of the larger types.

In view of the possibility that there might be an increasing demand for out-of-season milk-fed lamb Dorset Horn ewes were introduced on the Institute farm in 1930. Several agricultural writers of the past have referred to the peculiarity of Dorset Horn ewes in breeding "out of season." A century ago Youatt recorded that this peculiarity was more than locally recognized, and the fact that the Dorset Horn breed has not become more widely employed throughout the country is probably because out-of-season breeding did not prove especially profitable in the circumstances that existed in bygone years. The writer has ascertained that trials with Dorset Horn ewes were made in the past in this county. One of these trials was carried out some 50 years ago by a farmer who had the reputation of being a particularly shrewd and capable agriculturist and apparently he ultimately abandoned his project because there was no special demand at sufficiently remunerative prices for the fat lambs that he had ready for sale before Easter. As far as can be gathered, he experienced no difficulty in getting the Dorset Horn ewes to breed before Christmas.

More recently a trial was conducted with Dorset Horn ewes at Wye College. The Dorset Horn flock was, however, given up for the reason that it proved less profitable than the flock of Scotch Half-Breds; but at Wye, apparently, the Dorset Horn was used mainly for breeding about the beginning of the year, or just a little ahead of the Half-Breds. One can readily understand that, employed in this way, Dorset Horns might prove less profitable than Half-Breds, but surely the

special value of the Dorset ewe lies in her lambing in the period September to November; and the real test of the breed's profitableness must rest upon whether or not this special characteristic was adequately exploited.

The announcement made by the catering trade indicates that the breeding of lambs from late September onwards, to supply the demand between January and March, may now assume a fresh significance, and if a fair price is forthcoming for milk-fed lambs in the first three months of the year there should be no great difficulty in ensuring a supply.

On this farm there has been no trouble in getting the Dorset ewes to breed any time between late September and early June. Possibly they would have bred also between June and September, but they have not been put with the ram in order to breed in those months. Ewes have taken the ram at 10 days after lambing, but if the period of "heat" at this time has been missed, the ewes have apparently not come into "heat" again until, at the earliest, about 10 days after the lambs have been weaned.

Except for a short period last winter when the ewes and lambs were folded on roots—kale and swedes—these Dorset Horns have been kept entirely on permanent and temporary grass leys.

Among the results that have followed from improvements in the management of grass land in recent years, perhaps no effect has been more important than the lengthening of the grazing season, this giving an earlier bite in spring and prolonging the period when grass is plentiful, and of reasonably good feeding value, in the autumn. Those who have practised modern methods in the management of their pastures have had little difficulty in securing a supply of grass in September, and even for some time later. Where the pasture has been either well eaten down, or topped with the mower, in summer, and then rested, there has generally been plenty of fresh young, succulent grass for the keep of ewes in the autumn. Ewes breeding in September may thus be got fit on grass alone, or on grass coupled with an allowance of about ½ lb. of concentrated food per head per day, fed for the last three weeks or month of pregnancy. Ewes prepared in this way generally give little or no trouble at lambing, and usually milk satisfactorily. More difficulty arises in the case of ewes lambing later in the year, say in December, when the grass is less plentiful and of lower feeding value and the weather has become more inclement for freshly-born lambs. In exposed

or wet situations the provision of adequate shelter at lambing time, and while the lambs are young, then becomes more necessary.

As regards artificial feeding to replace or supplement grass, investigations recently carried out in Germany* have thrown light on the feeding of ewes and lambs generally. Luthge gives feeding standards for ewes for maintenance and production, and also standards for young lambs at various stages from 4 to 16 weeks old. The chief importance to us of these feeding standards is that they confirm in a general way sound practice in this country. The figures indicate that a ewe of some 130-140 lb. live weight requires for maintenance about 1¼ lb. starch equivalent, including about 0·15 lb. protein equivalent per day, while for production purposes the ration should be adjusted so that 1 lb. S.E. includes about ¼ lb. P.E. The quantity of S.E. provided in the form of concentrates, daily, must depend upon how the ewe is milking and how far the bulky foods supply S.E. and P.E. for production, over and above maintenance. The data provided by Luthge support the view that good grass and first-class meadow hay are eminently well-balanced foods for supplying the ewe's combined needs for maintenance and milk production. Where roots, say 10-14 lb. of swedes or mangolds and 1-2 lb. of hay, are employed in place of grass as the bulky foods for a ewe in milk, then the supplementary concentrated ration should be so balanced as to provide about ¼ lb. P.E. in each 1 lb. S.E. A suitable concentrated mixture having a composition of this nature is as follows :—

Ration (a)	*Ration (b)*
Parts by weight	*Parts by weight*
2 parts Crushed Peas	1 part Crushed Beans
2 ,, Linseed Cake	1 ,, Linseed Cake
1 part Bran	1½ ,, Crushed Oats
1 ,, Crushed Oats	½ ,, Bran
1 ,, Flaked Maize	
1 ,, Locust Bean Meal	
and	
1 ,, Decorticated Ground Nut Meal *or* Soya Bean Meal *or* Decorticated Cotton Seed Meal *or* ½ Fish Meal.	

Together with minerals in both cases : 2 lb. ground chalk and 1 lb. iodized salt in 1 cwt. of the mixture.

These rations are suitable for the lambs as well as for the ewes. As regards concentrated rations generally, the writer

* H. Luthge : *Feeding and Management of Sheep*, Göttingen, 1931.

has been specially impressed with the need to restrict the proportion of protein to the limit indicated. In one reported instance lambs were being fed on decorticated ground nut cake and crushed oats. The lambs evidently preferred the cake to the oats, and the older and stronger ones, which were able to force the smaller lambs away from the trough, picked out the cake and left the oats. The result was that a number of the bigger lambs became ill and several actually died before the cause was realized. For feeding to lambs, cubes or nuts made of suitable ingredients of good quality and containing mineral matter may, for the reason indicated, have an advantage over home-made mixtures. Unfortunately, most compound cubes, even when composed of declared ingredients, cannot be wholly relied upon. It should be recognized that the mere declaration of the names of the ingredients does not in itself ensure the suitability of the cube. The standard of quality of the ingredients is of fundamental importance.

It is too early to say whether the trial in out-of-season lamb production in progress here is likely to prove economically sound. All that can be submitted, at present, is that Dorset Horn ewes have bred readily out of season and at times suitable for the provision of milk-fed lambs for sale in January to March. The ewes have milked well, particularly when fed on autumn grass that has been short and succulent. The rate of growth and degree of "finish" secured in the lambs themselves have depended mainly upon the quantity of milk given by the ewes. Crossing with Ryeland and Suffolk rams is being practised, but the comparison has not yet proceeded far enough to permit of conclusions.

Lambs born in the latter part of last September were sold fat in mid-December; lambs born in October and November have been marketed up to February 8. They have averaged 42*s.* 4*d.* per head, and realized 7½*d.* per lb. live weight.

* * * * * *

DESCRIPTION	Price per qr. s. d.	Price per qr. lb.	Price per ton £ s.	Manurial value per ton £ s.	Cost of food value per ton £ s.	Starch equiv. per 100 lb.	Price per unit starch equiv. s. d.	Price per lb. starch equiv. d.	Protein equiv %
Wheat, British	—	—	6 5	0 10	5 15	72	1 7	0·85	9·6
Barley, British feeding	—	—	6 10	0 8	6 2	71	1 9	0·94	6·2
„ Persian	22 9	400	6 7	0 8	5 19	71	1 8	0·89	6·2
„ Russian	24 0	„	6 15	0 8	6 7	71	1 9	0·94	6·2
Oats, English, white	—	—	7 10	0 9	7 1	60	2 4	1·25	7·6
„ „ black and grey	—	—	6 13	0 9	6 4	60	2 1	1·12	7·6
„ Canadian No. 2 Western	23 0	320	8 2	0 9	7 13	60	2 7	1·38	7·6
„ „ mixed feed	17 6	„	6 3*	0 9	5 14	60	1 11	1·03	7·6
„ Argentine	19 6	„	6 17	0 9	6 8	60	2 2	1·16	7·6
„ Russian	22 9	„	8 0	0 9	7 11	60	2 6	1·34	7·6
Maize, Argentine	19 9	„	4 12	0 8	4 4	81	1 0	0·54	6·8
Beans, English winter	—	—	6 0§	1 0	5 0	66	1 6	0·80	20
Peas, Indian	—	—	8 5†	0 17	7 8	69	2 2	1·16	18
„ Japanese	—	—	26 15†	0 17	25 18	69	7 6	4·02	18
Dari	—	—	8 7†	0 10	7 17	74	2 1	1·12	7·2
Milling offals—									
Bran, British	—	—	6 5	0 19	5 6	42	2 6	1·34	10
„ broad	—	—	7 5	0 19	6 6	42	3 0	1·61	10
Middlings, fine, imported	—	—	6 15	0 14	6 1	69	1 9	0·94	12
„ coarse, British	—	—	6 10	0 14	5 16	58	2 0	1·07	11
Pollards, imported	—	—	5 15	0 19	4 16	60	1 7	0·85	11
Meal, barley	—	—	7 15	0 8	7 7	71	2 1	1·12	6·2
„ maize	—	—	5 10	0 8	5 2	81	1 3	0·67	6·8
„ „ white S. African	—	—	5 12§	0 8	5 4	81	1 3	0·67	6·8
„ „ germ	—	—	6 10	0 13	5 17	85	1 5	0·76	10
„ locust bean	—	—	6 2	0 6	5 16	71	1 8	0·89	3·6
„ bean	—	—	8 0	1 0	7 0	66	2 1	1·12	20
„ fish	—	—	15 0	2 16	12 4	53	4 7	2·45	48
Maize, cooked flaked	—	—	6 10	0 8	6 2	83	1 6	0·80	8·6
„ gluten feed	—	—	6 2	0 15	5 7	76	1 5	0·76	19
Linseed cake, English, 12% oil	—	—	8 17	1 4	7 13	74	2 1	1·12	25
„ „ „ 9% „	—	—	8 10	1 4	7 6	74	2 0	1·07	25
„ „ „ 8% „	—	—	8 5	1 4	7 1	74	1 11	1·03	25
Cottonseed cake—									
„ „ English 4½% oil	—	—	5 10	1 3	4 7	42	2 1	1·12	17
„ „ Egyptian 4½% „	—	—	5 2	1 3	3 19	42	1 11	1·03	17
Decorticated cottonseed meal 7% oil	—	—	8 5*	1 14	6 11	74	1 9	0·94	35
Ground-nut cake, 6-7% oil	—	—	7 15*	1 2	6 13	57	2 4	1·25	27
Decorticated ground-nut cake, 6-7% oil	—	—	8 7	1 13	6 14	73	1 10	0·98	41
Palm kernel cake, 4½-5½% oil	—	—	6 17§	0 14	6 3	75	1 8	0·89	17
„ „ „ meal 4½% „	—	—	7 7§	0 14	6 13	75	1 9	0·94	17
„ „ meal 1-2% „	—	—	6 15§	0 15	6 0	71	1 8	0·89	17
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	—	—	6 15	0 15	6 0	48	2 6	1·34	13
„ „ „ porter	—	—	6 5	0 15	5 10	48	2 4	1·25	13
Malt culms	—	—	6 10†	1 3	5 7	43	2 6	1·34	16
Dried sugar-beet pulp (*a*)	—	—	5 12	0 6	5 6	65	1 8	0·89	5·2

* At Bristol. † At Liverpool. § At Hull. (*a*) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of January, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 24*s.* per ton as shown above, the food value per ton is £8 16*s.* Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2*s.* 5*d.* Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1·29*d.* A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6*s.* 10*d.*; P_2O_5, 3*s.* 7*d.*; K_2O, 3*s.* 2*d.*

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	6 11
Maize	81	6·8	4 12
Decorticated ground-nut cake	73	41·0	8 7
„ cotton cake	71	34·0	7 14

(Add 10*s.* per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1·44 shillings, and per unit protein equivalent, 1·76 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 0
Oats	60	7·6	5 0
Barley	71	6·2	5 13
Potatoes	18	0·6	1 7
Swedes	7	0·7	0 11
Mangolds	7	0·4	0 11
Beans	66	20·0	6 10
Good meadow hay	37	4·6	3 1
Good oat straw	20	0·9	1 10
Good clover hay	38	7·0	3 7
Vetch and oat silage	13	1·6	1 1
Barley straw	23	0·7	1 14
Wheat straw	13	0·1	0 19
Bean straw	23	1·7	1 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6*d.* net.

* * * * * *

MISCELLANEOUS NOTES

The Agricultural Index Number

THE January index of agricultural produce normally shows a rise of several points over that recorded for December on account of the fact that prices in January of the base years 1911–13 were generally lower than those in December. The effect of this difference is again evident in the month under review, but while the increase of 5 points in the January index to 22 per cent. above 1911–13 has been due largely to this factor, there were increased prices for fat cattle and pigs, milk, cheese and potatoes which contributed very materially.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month	*Percentage increase compared with the average of the corresponding month in 1911-13*					
	1927	1928	1929	1930	1931	1932
January	49	45	45	48	30	22
February	45	43	44	44	26	—
March	43	45	43	39	23	—
April	43	51	46	37	23	—
May	42	54	44	34	22	—
June	41	53	40	31	23	—
July	42	45	41	34	21	—
August	42	44	52	35	21	—
September	43	44	52	42	20	—
October	40	39	42	29	13	—
November	37	41	44	29	12	—
December	38	40	43	26	17	—

Grain.—The average price of wheat during January was 5*s.* 10*d.* per cwt., or 6*d.* lower than in December and the index at 20 per cent. below pre-war showed a fall of 6 points on the month. Barley also was cheaper, the reduction of 2*d.* in the average to 8*s.* 3*d.* per cwt. being proportionately less than in January, 1911–13, so that the index rose by one point to 3 per cent. above 1911–13. The average quotation for oats, however, rose by 1*d.* to 7*s.* per cwt. and the level for January was 3 points higher at 2 per cent. above the base. This is the first occasion that oats have exceeded the pre-war level since January, 1930. A year ago, oats sold at 16 per cent. below pre-war.

Live Stock.—With the exception of fat sheep, the prices of fat stock were higher in January than in the previous month. Fat cattle were about 1*s.* per live cwt. dearer and the index advanced 9 points to 19 per cent. above the 1911–13 level.

Bacon pigs were about 6*d.* per score more than in December, and pork pigs showed a slight increase: in both cases there was a decline in the base and this had the effect of increasing the upward movement in the indices, that for bacon pigs being 9 points higher at 4 per cent. below 1911–13, while for pork pigs it was 7 points higher at 10 per cent. above. The decline of ¼*d.* per lb. in the case of fat sheep was less than in January, 1911–13, and the index rose by 4 points to 10 per cent. above pre-war. At this level, however, fat sheep showed a reduction of 40 points or no less than 27 per cent. on the year. Store stock, as is usual at this season, were mostly cheaper than in December, but the reduction for store cattle was very slight and much less than in the base years, so that the index was 4 points higher at 21 per cent. above pre-war. The fall in values for dairy cows by about 30*s.* per head was considerably larger than in pre-war years and the index was 2 points lower at 23 per cent. above 1911–13. Store sheep, at precisely the pre-war level, compared unfavourably with the figure of 48 per cent. above pre-war recorded a year ago, and store pigs at 27 per cent. above were also very much below the level of 114 per cent. in January, 1931.

Dairy and Poultry Produce.—Butter prices in January were below those in December and the index declined 2 points, but an increase occurred for cheese of 11 points, the latter commodity being at the comparatively high level of 22 per cent. above 1911–13, or one point above the position attained in January, 1931. Milk at 54 per cent. above pre-war showed a more favourable price to the producer than in December, but was 8 points below the level of a year ago. Eggs were about 2*d.* per dozen cheaper than in the previous month, but this seasonal decrease was not so large as in the base years and the increase of 14 points brought the index to 7 per cent. above pre-war. As regards poultry there was little alteration in prices of fowls and ducks, but geese were much cheaper and the combined index for poultry dropped by 12 points to 27 per cent. above the base level.

Other Commodities.—A very sharp increase in potato prices occurred in the month under review and the average price for the varieties used in calculating the index was three times that in pre-war years, and nearly double the price realised in January, 1931. Hay sold at the same price as in December, but as there was a slight advance in January, 1911–13, the index declined by 2 points to the exceptionally low level of 25 per cent. below pre-war. Prices of green vegetables were about

the same as in December, but there was a considerable advance in prices of carrots and onions, and the index for vegetables as a whole was just over 70 per cent. higher than pre-war. Wool was a little cheaper on the month, but the decrease was less than in 1911–13 and the index advanced one point.

Index numbers of different commodities during recent months and in January, 1930 and 1931, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13

Commodity	1930	1931				1932
	Jan.	Jan.	Oct.	Nov.	Dec.	Jan.
Wheat	30	—24*	—24*	—10*	—14*	—20*
Barley	7	3	8	6	2	3
Oats..	1	—16*	—11*	— 2*	— 1*	2
Fat cattle	38	27	18	15	10	19
„ sheep	67	50	28	13	6	10
Bacon pigs	90	34	—12*	—12*	—13*	— 4*
Pork „	98	57	3	2	3	10
Dairy cows	33	33	22	23	25	23
Store cattle..	25	28	18	18	17	21
„ sheep	55	48	18	12	1	Nil
„ pigs	137	114	31	29	20	27
Eggs	40	23	29	23	— 7*	7
Poultry	44	47	30	27	39	27
Milk	67	62	19	21	50	54
Butter	44	14	5	5	10	8
Cheese	37	21	8	6	11	22
Potatoes	— 4*	71	110	131	159	203
Hay	38	— 8*	—19*	—22*	—23*	—25*
Wool	32	—22*	—24*	—21*	—21*	—20*

* Decrease.

* * * * * *

Combine Harvesting in 1931

THE progress of Combine Harvesting in this country up to the end of the 1930 harvest was described in an article that appeared in the June, 1931, issue of this JOURNAL. As was expected, the number of privately owned combine harvesters used in the 1931 harvest rose. While there were only four used in 1930, ten were used last year. Two of these were, however, purchased during the harvest and did not deal with a very large acreage. The work of these machines has been carefully watched by the Institute for Research in Agricultural Engineering, University of Oxford, and a report has now been published. Copies of this report can be obtained through any bookseller, or direct from the Institute, price 6*d.* net.

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended September, 1931, compared with the corresponding period of 1930. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	July to Sept., 1931		July to Sept., 1930	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	35	3,590	33	4,716
Belgium	7	315	145	3,380
Brazil	6	365	1	100
Chile	0	0	1	1,050
Soviet Union (Russia)	453	21,450	0	0
United States of America	0	0	29	2,441
Uruguay	0	0	14	3,445
Irish Free State	237	4,580	409	8,808
Newfoundland	0	0	18	720
Union of South Africa	15	1,020	11	921
Other countries	7	172	7	865
Total	760	31,492	668	26,446
SHEEP AND LAMBS				
Argentina	24	650	203	3,500
Belgium	16	54	13	172
Brazil	6	410	10	150
France	5	153	39	543
United States of America	1	100	69	1,127
Uruguay	0	0	162	3,174
Australia	6	70	12	333
Canada	0	0	37	367
Irish Free State	82	365	199	1,081
Other countries	3	50	26	558
Total	143	1,852	770	11,005
SWINE				
Belgium	0	0	5	127
Denmark	0	0	12	270
Germany	0	0	4	126
Greece	0	0	6	175
Italy	6	150	2	25
Japan	10	603	16	442
Poland	106	2,170	2	84
Australia	0	0	5	180
Gold Coast	4	15	6	82
Irish Free State	13	344	127	2,139
Other countries	15	235	18	292
Total	154	3,517	203	3,942

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended December, 1931, compared with the corresponding period of 1930. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	Oct. to Dec., 1931		Oct. to Dec., 1930	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	19	3,905	2	250
Belgium	1	35	111	2,665
Soviet Union (Russia) ..	204	8,058	0	0
Australia	18	1,691	29	2,642
British India	1	11	6	435
Hong Kong	30	1,200	0	0
Irish Free State	377	5,434	567	9,934
Kenya	14	813	14	726
Canada	48	2,460	5	355
Union of South Africa ..	31	1,990	28	2,061
Other countries	13	419	54	3,626
Total	756	26,016	816	22,694
SHEEP AND LAMBS				
Argentina	106	2,535	240	7,235
Brazil	18	894	2	95
Chile	25	727	95	2,271
France	20	160	16	97
Spain	8	66	26	410
Uruguay	29	650	119	3,245
Australia	1	42	32	606
Canada	9	135	10	120
Irish Free State	307	1,745	599	2,865
Union of South Africa ..	9	130	7	71
Other countries	14	205	29	255
Total	546	7,289	1,175	17,270
SWINE				
Denmark	4	100	0	0
France	7	77	6	111
Germany	0	0	63	1,347
Japan	1	135	2	273
Lithuania	31	600	0	0
Poland	5	70	8	148
Soviet Union (Russia) ..	228	4,226	0	0
British India	2	36	4	200
Irish Free State ..	0	0	7	38
Other countries	16	342	26	693
Total	294	5,586	116	2,810

Export of Breeding Stock in 1931

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland during 1931, with comparative figures for 1930. (From the "Annual Statement of Trade" and returns supplied by H.M. Customs and Excise.)

Country to which exported	1931		1930	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	159	27,821	198	29,978
Belgium	76	1,918	309	8,571
Brazil	13	1,265	31	3,085
Italy	48	2,600	2	47
Soviet Union (Russia) ..	657	29,508	0	0
Uruguay	28	2,715	57	9,330
Australia	50	4,706	129	13,865
Canada	76	5,260	232	15,770
Irish Free State ..	1,644	33,807	1,947	44,837
Southern Rhodesia ..	11	671	42	3,465
Union of South Africa ..	65	4,798	89	6,235
Other countries	109	5,350	237	17,191
Total	2,936	120,419	3,273	152,374
SHEEP AND LAMBS				
Argentina	187	4,565	576	13,885
Brazil	24	1,304	97	2,110
Chile	25	727	125	3,892
France	69	773	94	1,022
Uruguay	29	650	284	6,839
United States of America	1	100	239	3,851
Canada	20	245	416	6,589
Irish Free State ..	442	2,437	822	4,342
Union of South Africa ..	138	1,375	66	881
Other countries	159	2,310	197	3,607
Total	1,094	14,486	2,916	47,018
SWINE				
France	53	865	18	317
Italy	49	620	5	84
Lithuania	31	600	0	0
Poland	195	3,650	11	257
Roumania	21	252	0	0
Soviet Union (Russia) ..	228	4,226	0	0
Yugo-Slavia	130	2,821	3	60
Irish Free State ..	23	449	228	3,051
Hong Kong	15	338	0	0
Other countries	88	2,343	308	6,255
Total	833	16,164	573	10,024

Advice on Manuring

READERS of this JOURNAL have already been advised of the publication of Bulletin No. 28, *Artificial Fertilizers in Modern Agriculture*. The Ministry finds, however, that there is still a demand for a publication on manuring giving advice of a somewhat simpler and more popular nature. To meet this demand Sectional Volume of Leaflets No. 8 on Manures and Manuring has been considerably revised by Mr. H. V. Garner, M.A., B.Sc., of Rothamsted Experimental Station, and re-issued as Bulletin No. 36.*

The purpose of the volume is to supply, in a compact form, the information farmers need if they are to derive the fullest advantage from the money they spend on fertilizers. Part I deals with farmyard and other organic manures; Part II with artificial fertilizers, including compound manures; and Part III contains advice on purchase and valuation, suggests suitable mixtures for the ordinary farm crops, and closes with a note on soil analysis, its limitations and the directions in which it may be of use to farmers. A useful summary of the most important provisions (as regard fertilizers) of the Fertilizers and Feeding Stuffs Act, 1926, is given in the form of an Appendix. Primarily intended for farmers, this work of some eighty-five pages should also be of interest to the fertilizer trade.

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Fertility in Farm Animals

FOR the practical farmer it is a matter of the greatest economic importance that his breeding-stock should be completely fertile. There is a heavy financial loss on every animal remaining sterile for one, or more than one, season: the cost of maintenance is expensive, and no compensating return is obtained from the production of young.

Low fertility and sterility of a temporary nature, because of their prevalence, are the cause of much greater loss to the breeding-industry than infertility of a more permanent kind that occurs less frequently, although the latter, because of its striking effects, generally attracts most attention. With most commercial farm animals it will generally pay best to kill rather than to try to cure an animal affected with one of the forms of more permanent sterility, but a knowledge of the

* Bulletin No. 36, *Manures and Manuring*, obtainable through any bookseller, or direct from H.M. Stationery Office, price 1*s.* 3*d.* (post free 1*s.* 5*d.*).

conditions that affect fertility will frequently enable the breeder to avoid or prevent the occurrence of both sterility and reduced fertility when of a temporary nature.

The Ministry's earlier publication (*The Physiology of Animal Breeding*), in which the general problem of fertility and the various abnormal conditions that give rise to barrenness were dealt with, has been out of print for some time. The authors, Dr. F. H. A. Marshall, F.R.S., and Mr. John Hammond, M.A., of the Animal Nutrition Institute, Cambridge, have now considerably revised the work, and it appears in its third edition as Bulletin No. 39.* The specific cases of the chief farm animals, horses, cattle, sheep and pigs, are discussed at length, while brief notes are also given on the goat, dog, ferret and rabbit. Except for the preliminary physiological descriptions, which are indispensable to the understanding of the rest of the work, the Bulletin is entirely practical in its bearing.

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Advisory Leaflets

SINCE the date of the list published in the November, 1931, issue of this JOURNAL (p. 872), the undermentioned Advisory Leaflets have been issued by the Ministry. The leaflets starred are re-issues, without substantial revision, of leaflets in the old series, and have not, therefore, been circulated to leaflet subscribers under the scheme set out in the December, 1930, issue of this JOURNAL. Copies of any or all of the starred leaflets will, however, be supplied free and post free to any leaflet subscriber who makes application.

No. 71. Colorado Beetle : *with coloured plate.*
„ *72. Tuberculosis in Farm Stock.
„ 73. Prevention of Cruelty to Animals.
„ 74. Anthrax.
„ *81. Peach Leaf-Curl.
„ 82. The Construction of Cow-houses.
„ *83. Swine Fever.
„ 84. The Pear and Cherry Sawfly.
„ 85. The Downy Mildew of the Onion.
„ 86. The Greenhouse White Fly.
„ 87. The Celery Fly.
„ *88. The Brown Scale.
„ 89. "Couch" or "Twitch."
„ 90. Essential Points in Poultry-Feeding.
„ *91. The Mangold Fly.
„ *92. Fumigation with Hydrocyanic Acid Gas.
„ *96. The Apple Sucker.

* Bulletin No. 39, *Fertility and Animal Breeding*, obtainable through any bookseller, or direct from H.M. Stationery Office, price 1*s.* 6*d.* net (post free 1*s.* 8*d.*).

The International Year Book of Agricultural Statistics.—The International Institute of Agriculture at Rome has recently published the 1930-31 edition of the *International Year Book of Agricultural Statistics*. This volume of some 830 pages is the result of the most extensive and detailed inquiry made in the domain of international agricultural statistics and constitutes a work of the greatest importance to all those who are interested in questions having a direct or indirect relation to production and commerce of agricultural products.

Figures for area and population of 220 countries in the years nearest to 1913 and 1930 are classified in the first part of the Year Book. The presentation of these figures throws light upon the world situation from the geographical and political points of view during both the pre-war and post-war periods. The second part of the Year Book is composed of a series of tables comprising for nearly 50 countries the available data concerning the uses for which the total area is employed, the apportionment of cultivated areas between the different crops, agricultural production, numbers of the different kinds of livestock and the products derived from them. In the tables constituting the third part of the volume are given the area, production and yield per acre in each country during the last five years of the pre-war period and during each of the years from 1927 to 1930 for nearly 40 agricultural products.

For each kind of live stock all available figures in the different countries have been grouped for the years 1913 and 1926 to 1930. A large part of the volume is devoted to statistics of the commercial movement of 42 vegetable products and 12 products of animal origin. The figures published relate to the imports and exports during the calendar years and for the cereals also during the commercial seasons. It may be added that the tables of production and commerce not only specify details for each country but also the totals for the different continents and hemispheres and for the whole world, and give a general idea of the changes taking place during the periods under consideration in the area under each crop, quantities harvested and the commercial movement in each product.

The part devoted to prices contains the weekly quotations of 25 agricultural products on the principal world markets for the year 1913 and for the period January, 1927, to July, 1931. In the freights section will be found the quotations for the transport of wheat, maize and rice on the most important shipping routes, and in the section reserved for fertilizers and chemical products useful in agriculture are published statistics of production, trade and prices for 15 products. In the rates of exchange section are set out the rates on the New York Exchange for the most important currencies, and the Appendix includes special chapters on the importance and distribution of the agricultural population, the distribution of agricultural holdings according to their size and mode of tenure, and forestry.

Copies of the volume may be purchased from P. S. King & Son, Ltd., 14 Great Smith Street, London, S.W. 1, price 30*s*.

* * * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Tuesday, February 2, the Chairman, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders :—

Lincolnshire : Kesteven and Lindsey.—An Order varying as from February 14, 1932, the existing minimum and overtime rates of

wages so as to provide that the minimum rates in the case of male workers of 21 years of age and over shall be as follows :—

Waggoners.—37*s.* (instead of 39*s.* as at present) per week of 61 hours during the period from October 15 to May 13 and 58 hours during the remainder of the year.

Shepherds.—35*s.* (instead of 37*s.* as at present) per week of 55 hours in summer and 56 hours in winter.

Stockmen.—36*s.* (instead of 38*s.* as at present) per week of 56 hours in summer and 58 hours in winter.

Other male workers.—30*s.* (instead of 32*s.* as at present) per week of 48 hours in winter and 53 hours in summer.

In the case of shepherds additional sums are payable in respect of employment during the lambing season in connexion with the care of sheep.

The overtime rates in the case of all classes of male workers of 21 years of age and over are 9*d.* per hour (instead of 9½*d.* per hour as at present) on week-days and 11*d.* (instead of 11½*d.* per hour as at present) on Sundays. In the case of female workers of 17 years of age and over the minimum rate is 5½*d.* per hour for all time worked.

These rates will continue in force until March 6, 1932.

Northumberland.—An Order fixing minimum and overtime rates of wages to come into force at noon on May 13 (when the existing rates are due to expire). The minimum rates in the case of stewards, horsemen, cattlemen, stockmen and shepherds of 21 years of age and over are 37*s.* 6*d.* for householders and 34*s.* 6*d.* for non-householders, per week of not more than 62 hours. In the case of other male workers of 21 years of age and over (except casual workers for whom the rate is 7*d.* per hour) the minimum rate is 30*s.* 6*d.* per week of 48 hours in winter and 52½ hours in summer. All the above weekly rates are 1*s.* 6*d.* per week less than the rates at present in force. The overtime rates in the case of all classes of male workers (except casual workers) are 9*d.* per hour on week-days and 11*d.* per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 6*d.* per hour, except in the case of casual workers for whom the minimum rate is 3*d.* per hour with overtime at 4*d.* per hour.

These rates will continue in force until noon on May 13, 1933.

Worcestershire.—An Order fixing minimum and overtime rates of wages to come into force on March 6, 1932 (*i.e.*, the day following that on which the existing rates are due to expire) and to continue in force until March 5, 1933.

The minimum rate in the case of male workers of 21 years of age and over is 30*s.* per week of 44 hours during the week in which Good Friday falls, 53 hours in any other week in summer (instead of 43 hours and 52 hours, respectively, as at present), 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter. The overtime rate for male workers of the same age is 8*d.* per hour (instead of 9*d.* per hour as at present). In the case of female workers of 18 years of age and over the minimum rate is 5*d.* per hour with overtime at 5¾*d.* per hour.

Denbigh and Flint.—An Order fixing minimum and overtime rates of wages to come into force on February 16, 1932 (*i.e.*, the day following that on which the existing rates are due to expire), and to continue in force until February 15, 1933.

The minimum rate in the case of male workers of 21 years of age and over employed wholly or mainly as team-men, cattlemen, cowmen, shepherds or bailiffs is 35*s.* per week of 60 hours (instead

of 37*s.* per week of 61 hours as at present). In the case of other male workers of 21 years of age and over the minimum rate remains unchanged at 30*s.* 6*d.* per week of 50 hours. The overtime rate for all classes of male workers of 21 years of age and over is 9*d.* per hour.

In the case of female workers of 18 years of age and over the minimum is 5*d.* per hour with overtime at 6½*d.* per hour.

Copies of the Orders in full may be obtained, free of charge, on application to the Secretary of the Agricultural Wages Board.

* * * * * *

Enforcement of Minimum Rates of Wages.—During the month ended February 14, legal proceedings were instituted against nine employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines	Costs	Arrears of wages	No. of workers involved
		£ *s.* *d.*	£ *s.* *d.*	£ *s.* d.	
Cornwall ..	Newquay .	0 10 0	3 3 0	43 1 9	2
„ ..	„ .	0 10 0	3 3 0	22 8 0	2
Derby ..	Bakewell .	†		4 0 0	1
Hereford ..	Bromyard .	0 10 0	0 10 0	3 5 10	1
Hereford ..	Ledbury ..	2 0 0	1 0 0	8 2 0	3
Northumberland ..	Newcastle .	2 0 0	0 8 6	4 8 1	1
Surrey ..	Reigate ..	2 0 0	0 2 6	4 0 0	1
Yorks, N.R.	Leyburn ..	*	—	—	1
Denbigh ..	Wrexham .	*	—	—	1
		£7 10 0	£8 7 0	£89 5 8	13

* Case dismissed. † Dismissed under Probation of Offenders Act.

In addition to the above, proceedings were taken against an employer at Ashbourne under Section 9 (3) (d) for giving false information and a fine of £2 was imposed.

* * * * * *

Foot-and-Mouth Disease.—There has been no outbreak of Foot-and-Mouth Disease in Great Britain since the last issue of this JOURNAL went to press, and there is now no part of Great Britain subject to Foot-and-Mouth Disease (Infected Area) Restrictions.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS OF ENGLAND AND WALES

IN consequence of the numerous changes that have occurred since the lists of the County Education Staffs were published in the April and May, 1928, issues of the JOURNAL, the full lists, revised to date, are now being republished for purposes of reference. A first instalment of the lists of County Staffs in England was given in the issue for last month (February): the remaining lists of the English County Staffs and those of the Welsh County Staffs are as under.

NOTE.—The officers are wholly employed unless otherwise indicated by the following reference marks:—

* Wholly employed by the County Council, but only partially on agricultural education work.

† Partially employed.

‡ Seasonal and other temporary whole-time appointments.

ENGLAND

Lancashire

Hutton Farm School and County Staff

Principal and County Agricultural Organizer	J. J. GREEN, B.Sc.
District Agricultural Lecturers	C. P. MAY, M.A. G. F. KINGSTON, M.A. W. B. NICOLL, B.Sc. G. B. WELLS, N.D.A., N.D.D.
Instructors in Horticulture	N. J. MACPHERSON W. L. STEER
Instructor in Cheesemaking (Itinerant)	R. RICHARDSON, N.D.A.
Head Lecturer in Poultry-keeping	C. H. DOBBIN
Adviser in Poultry-keeping	G. M. ROBERTSON
Assistant Instructresses in Poultry-keeping	Miss K. H. ARTHUR Miss N. S. MILNE, N.D.D.
Head Dairying Instructress	Miss J. STUBBS, N.D.D.
Assistant Dairying Instructress	Miss E. M. WHEELER, B.Sc., N.D.D.
Dairy Bacteriologist	F. PROCTOR, M.A.
Lecturer in Veterinary Hygiene	C. BLACKHURST, M.R.C.V.S.†
Instructor in Hedging	J. KNOWLES‡
Instructor in Walling	E. EWAN‡
Farm Bailiff	J. M. ANDREW
Matron	Miss J. E. BORRETT

Harris Institute, Preston (Agricultural School)

Lecturer in Botany and Bacteriology	H. EDMUNDS, B.Sc.†
Lecturer in Dairy and Agricultural Chemistry	E. TAYLOR, M.Sc.†
Lecturer in Farm Buildings	E. M. PEARSON, A.R.S.I.†
Lecturer in Dairy Machinery	F. W. WALKER†
Lecturer in Engineering	G. E. HALL, B.Sc.†
Instructor in Farm Book-keeping	W. WEBSTER, B.Sc.†

Leicestershire

Agricultural Organizer	T. HACKING, LL.B., M.Sc.*	
Instructor in Horticulture	T. G. BULLOCK, F.R.H.S.*	
Instructress in Dairying	Miss E. PRATT-SADDINGTON	
Instructor in Poultry-keeping	H. T. ATKINSON, N.D.P.	
Instructors in Veterinary Hygiene	R. L. PHILLIPS† W. L. GASCOYNE† H. THORNTON†	
Manageress of Egg Laying Trials	Vacant†	Working in conjunction with Notts.
Assistant to Manageress of Egg Laying Trials	F. HAYWOOD†	Working in conjunction with Notts.
Instructor in Hedging	W. HUTT†	

Lincolnshire (Holland)

Kirton Agricultural Institute Staff

Principal, Agricultural Organizer and Horticultural Superintendent	J. C. WALLACE, M.C.

Agricultural Mycologist	E. R. WALLACE, B.A.
Agricultural Chemist	F. W. HANDLEY, B.Sc., Ph.D.
Assistant Agricultural Chemist ..	J. HARGRAVE, B.Sc.
Agricultural Entomologist ..	J. WOOD, A.R.C.Sc., D.I.C.
Assistant Lecturer in Agriculture	J. K. THOMPSON, N.D.A.
Assistant for Bulb Research ..	D. E. HORTON
Instructor in Poultry-keeping ..	G. H. REED
Farm Bailiff	A. L. KING
Manageress of Egg Laying Trials	Miss E. BROWN

Lincolnshire (Kesteven)

Agricultural Organizer	F. WAKERLEY, M.Sc., F.H.A.S.
Instructress in Dairying and Poultry-keeping	Miss R. JACKSON, N.D.D., B.D.F.D.
Manageress of Egg Laying Trials..	Miss G. E. BELLAMY† (Working in conjunction with Lincs. (Lindsey).
Assistant Manageress of Egg Laying Trials	Miss E. G. MARTIN† (Working in conjunction with Lincs. (Lindsey).

Local Instructors in Sheep-Shearing, Veterinary Hygiene, etc., are engaged as required.

Lincolnshire (Lindsey)

Agricultural Organizer	A. McVICAR, B.Sc., N.D.A., N.D.D.
Horticultural Instructor	J. G. MURRAY, F.L.S.*
Instructors in Bee-keeping ..	J. H. HADFIELD† / W. ION† / F. J. CRIBB†
Instructor in Poultry-keeping ..	A. TYLER
Instructress in Dairying and Domestic Science	Vacant*
Instructor in Veterinary Hygiene	W. IRONSIDE, M.R.C.V.S.*
Manageress of Egg Laying Trials..	Miss G. E. BELLAMY† (Working in conjunction with Lincs. (Kesteven)
Assistant Manageress of Egg Laying Trials	Miss E. G. MARTIN† (Working in conjunction with Lincs. (Kesteven)

Middlesex

Agricultural Organizer	H. R. WILLIAMS, B.Sc.
Horticultural Superintendent ..	J. LAWSON
Instructor in Horticulture ..	G. W. PYMAN*
Assistant Instructress in Horticulture	Miss M. MASON, B.Sc.*
Instructor in Poultry-keeping ..	J. WORTHINGTON
Assistant Poultry Instructor ..	W. WELLS, N.D.P.‡
Manager of Egg Laying Trials ..	A. A. EASTWOOD
Assistant at Denham Demonstration Plot	J. W. B. HOLM

Norfolk

Agricultural Organizer	F. RAYNS, M.A., N.D.A., N.D.D.†
Assistant Agricultural Organizer..	J. C. MANN, M.A., A.I.C.
Advisory Officer for West Norfolk	G. H. BATES, B.Sc.
Horticultural Superintendent ..	H. GOUDE, N.D.H.
Asst. Instructors in Horticulture..	E. G. DAVISON* / C. E. GRAINGER* / P. E. CROSS, N.D.H.*
Poultry Adviser for East Norfolk	T. D. BELL, N.D.P.
Poultry Adviser for West Norfolk	E. V. BEARD
Manageress of Egg Laying Trials	Miss E. TURNBULL‡

Northamptonshire

Staff of County Farm Institute, Moulton

Principal and Agricultural Organizer	W. A. STEWART, M.A., B.Sc.
Warden and Assistant Agricultural Organizer	H. L. WEBB, M.A.
Agricultural Assistant	R. O. WOOD, B.Sc.
Horticultural Instructor	C. F. LAWRENCE, F.R.H.S.*
Assistant Horticultural Instructor	H. J. WYLES*
Instructress in Dairying and Poultry-keeping	Miss J. W. STRANG, N.D.D., C.D.D.
Assistant Poultry Instructress	Miss E. T. WILSON, N.D.D.
Assistant Dairying Instructor	D. MACKELLAR‡
Manager of Egg Laying Trials	C. JACKSON
Instructor in Veterinary Hygiene	T. F. SPENCER, M.R.C.V.S.†
Instructor in Bee-keeping	H. F. SWANN†
Farm Bailiff	A. JACKSON‡
Matron	Miss E. G. BARRITT

Northumberland

Agricultural Organizer	A. R. WANNOP, B.Sc.
Assistant Agricultural Organizer	W. CRAIB, B.Sc.
Instructor in Horticulture	C. W. MAYHEW
Instructress in Dairying and Poultry-keeping	Miss A. BROTHERTON, N.D.D.*
Farm Steward, Cockle Park Experimental Station	N.P.S.C. ARMSTRONG

Nottinghamshire

Agricultural Organizer	R. N. DOWLING, N.D.A., P.A.S.I.
Assistant Agricultural Organizer	K. D. R. DAVIS, M.A.
Instructor for Smallholders	C. H. MARR
Horticultural Superintendent	C. TABORN, F.R.H.S., F.L.S.
Assistant Instructors in Horticulture	H. J. MANSER R. A. DRUMMOND*
Instructress in Fruit Preservation	Mrs. A. ROBINSON*
Instructress in Dairying	Miss H. S. Wood, N.D.D.
Assistant Instructress in Dairying	Miss A. A. SHEARMAN, N.D.D. C.D.D.
Instructor in Small Livestock	W. M. GAIR
Instructor in Manual Processes	J. S. FEATHERSTONE
Instructor in Bee-keeping	A. RILEY†
Instructor in Veterinary Hygiene	F. B. GRESHAM, M.R.C.V.S.
Manageress of Egg Laying Trials	Vacant†
Assistant to Manageress of Egg Laying Trials	F. HAYWARD† (Working in conjunction with Leics.)

Various part-time instructors are also employed for agricultural and horticultural classes.

Oxfordshire

Agricultural Organizer	G. R. BLAND, N.D.A., N.D.D.
Instructor in Horticulture	S. HEATON, F.R.H.S.*
Instructresses in Dairying and Poultry-keeping	Miss M. C. GRAHAM, N.D.D. Miss D. V. S. LAMB, N.D.D.
Instructor in Thatching and Hedging	G. D. SYKES†
Instructor in Farriery and Welding	J. WILSON†

Rutland

Agricultural Organizer	I. P. MACEWAN, B.Sc.*

Instructor in Horticulture ..	J. H. WOOLLEY, F.R.H.S.†
Instructress in Dairying and Poultry-keeping	Miss E. WEBB, N.D.D.
Instructor in Hedge Layering and Sheep Shearing	S. MEADOWS†

Salop

Agricultural Organizer	E. DRUCE, M.R.A.C.
Agricultural Instructor	W. E. USHER, B.Sc.
Horticultural Adviser	G. T. MALTHOUSE*
Horticultural Lecturers	Miss M. HERON, N.D.H.* A. H. WHYTE
Instructor in Bee-keeping ..	J. A. SMITH†
Instructress in Dairying	Miss E. M. DAWSON, N.D.D.
Instructor in Poultry-keeping ..	O. CROWTHER
Assistant Instructress in Poultry-keeping	Miss M. G. SPURR, N.D.P.
Instructor in Veterinary Hygiene	K. D. DOWNHAM, B.V.Sc., M.R.C.V.S., D.V.H.†
Instructor in Farriery	C. RICHARDSON, F.W.C.F.
Manageress of Egg Laying Trials..	Miss B. HALFORD
Instructor in Hedging	W. T. BEECH‡
Instructors in Sheep-Shearing ..	H. MORGAN‡ H. G. INGRAM‡

Somerset

Somerset Farm Institute Staff

Principal and Agricultural Organizer	W. D. HAY, B.Sc.
Vice-Principal	G. G. GREGORY, N.D.A.
Assistant Agricultural Organizer..	A. MURCHIE, B.Sc.,N.D.A., N.D.D.
Crop Recorder	G. E. FURSE, N.D.A.*
Horticultural Superintendent ..	A. D. TURNER, N.D.H.
Instructor in Horticulture ..	J. CLAVIN, F.R.H.S.
Assistant Instructor in Horticulture	J. E. FORSHAW
Instructor in Gardening and Head Gardener	R. A. ENGLEDOW
Instructors in Bee-keeping ..	L. BIGG-WITHER, B.B.K.A.† W. A. WITHYCOMBE, B.B.K.A.†
County Superintendent of Dairying	Miss M. C. TAYLOR, N.D.D.
Head Instructress in Dairying ..	Miss E. M. MONIE, N.D.D., C.D.D.
Instructresses in Dairying ..	Miss M. BRITTAIN, N.D.D., B.D.F.D. Miss L. TOMLINSON, N.D.D.
Chief Instructor in Poultry-keeping	Vacant
Assistant Instructress in Poultry-keeping	Miss M. L. MANN, N.D.P.
Assistant Instructor in Poultry-keeping	F. R. WALLBUTTON
Manager of Egg Laying Trials ..	W. S. TURNER
Instructors in Veterinary Hygiene	E. C. BOVETT, M.R.C.V.S.† J. C. S. POWELL, M.R.C.V.S.†
Matron	Miss V. E. BIDMEAD

Staffordshire

Staff of County Farm Institute, Rodbaston

Principal and Agricultural Organizer	J. C. RUSHTON, F.H.A.S.

Instructor in Agriculture	H. B. TILLEY, B.Sc.
Assistant Instructor in Agriculture	Vacant
Horticultural Adviser	J. STONEY, F.R.H.S.
Instructor in Horticulture	C. D. DEMPSTER, C.D.H., F.R.H.S.*
Instructor in Bee-keeping	J. PRICE, F.E.S.
Instructor in Dairying	R. A. JEFFERY, N.D.A., N.D.D.
Instructress in Dairying	Miss E. NOBLE, N.D.D.
Instructor in Poultry-keeping	A. THOMSON
Assistant Instructor in Poultry-keeping	L. J. SHELLEY
Instructress in Domestic Subjects	Miss M. TURNER*
Instructor in Veterinary Hygiene	W. THOMSON, M.R.C.V.S.†
Instructor in Farriery	J. D. G. HARRIS, A.F.C.L., R.S.S., M.I.W.E.
Instructor in Woodwork	J. CRUTCHLEY
Farm Bailiff	J. FORTESCUE
Matron	Miss P. WILKINSON
Instructor in Gardening	J. APSE†
Manager of Egg Laying Trials	J. COOKE

Suffolk, East

Agricultural Organizer	A. W. OLDERSHAW, B.Sc.	
Assistant to Agricultural Organizer	Vacant	
Instructors in Horticulture	T. PAYNE, B.B.K.A.† W. C. WHITE, N.D.H.† A. B. THORN†	
Instructress in Dairying	Miss F. N. CRAWTER, N.D.D., B.D.F.D.	Joint Instructors with West Suffolk
Instructor in Poultry-keeping	H. D. DAY	
Manager of Egg Laying Trials	W. LONGWILL	

Suffolk, West

Agricultural Organizer	R. SAYCE, B.Sc., N.D.A.	
Instructress in Dairying	Miss F. N. CRAWTER, N.D.D., B.D.F.D.	Joint Instructors with East Suffolk
Instructor in Poultry-keeping	H. D. DAY	
Manager of Egg Laying Trials	W. LONGWILL	
Instructor in Horticulture and Bee-keeping	E. G. CREEK*	

Surrey

Agricultural Organizer	J. H. MATTINSON, B.Sc.
Assistant Instructor in Agriculture	R. LINE, B.Sc., N.D.A.
Horticultural Adviser	A. E. BURGESS, M.B.E., F.R.H.S.*
Instructors in Horticulture	C. H. MIDDLETON, F.R.H.S.* C. H. WALKDEN* W. H. DIVERS, V.H.H., F.R.H.S.† A. HOSKINGS†
Instructress in Fruit Preservation	Mrs. A. WEBB†
Adviser in Poultry-keeping	Miss E. E. KIDD, F.B.S.A.
Assistant Instructress in Small Livestock	Miss N. BUTCHART, N.D.D., B.D.F.D.
Manageress of Egg Laying Trials	Miss R. M. WARE
Instructor in Farriery	W. WARDLEY, R.S.S.†
Demonstrator in Bee-keeping	Miss MILNE†

Sussex, East

East Sussex Agricultural Institute, Plumpton

Principal and Agricultural Organizer	R. H. B. JESSE, B.Sc., N.D.A.*
Lecturer in Agricultural Chemistry	R. C. SAXBY
Lecturer in Agriculture	B. J. FRICKER, N.D.A., N.D.D.
Horticultural Superintendent	G. C. JOHNSON
Instructor in Bee-keeping	F. KENWARD, B.B.K.A.†
Instructors in Poultry-keeping	O. R. STEVENSON, N.D.P. S. C. SHARPE†
Instructress in Dairying	Miss J. MACGILLIVRAY, N.D.D.
Instructor in Farriery	A. SMITH, R.S.S.†
Instructor in Veterinary Hygiene	A. L. FARRANT, F.R.C.V.S.†
Instructor in Hedging and Thatching	H. E. CANDY
Instructor in Clean Milk	T. PAGET*
Instructress in Fruit Preservation	Miss M. MARTIN†
Matron	Miss E. C. BURDFIELD
Manageress of Egg Laying Trials	J. MUIR

Sussex, West

Agricultural Organizer	W. LAWSON, M.B.E., N.D.A., N.D.D.*
Assistant Agricultural Organizer and Instructor in Dairying	J. C. W. SIMMS, B.Sc., N.D.D.
Horticultural Superintendent	F. W. COSTIN, N.D.H., F.R.H.S.
Instructress in Poultry-Husbandry	Miss E. G. STOWARD, N.D.P.
Instructor in Bee-keeping	F. KENWARD†
Manageress of Egg Laying Trials	Miss C. E. DAY, N.D.P.

Warwickshire

Agricultural Organizer	W. IRONS, M.A., B.Sc.
Assistant Agricultural Organizers	J. E. BULL, N.D.A. A. H. WILSON, N.D.A., N.D.D. Miss A. IRONSIDE, N.D.D.
Horticultural Instructor	G. H. NASH, N.D.H.*
Assistant Horticultural Instructor	P. CRAGG*
Instructor in Poultry-keeping	A. F. TOMEY
Manager of Egg Laying Trials	F. O. MORRIS, N.D.P.

Westmorland

(*See Cumberland*)

Wiltshire

Agricultural Organizer	W. T. PRICE, M.C., P.A.S.I., N.D.A., N.D.D.*
Assistant Agricultural Organizers	H. W. TOMLINSON, N.D.A., N.D.D. L. D. C. MCLEES, B.Sc., N.D.A., N.D.D.
Assistant Organizer for Dairy Husbandry	T. C. GODDARD, B.Sc., N.D.D.
Horticultural Superintendent	W. C. CRISP, N.D.H.
Instructor in Poultry-keeping	H. F. BURDETT
Manager of Egg Laying Trials	J. O'H. LETTS
Instructress in Dairying	Mrs. I. M. BULL, N.D.D.‡

Worcester

Agricultural Organizer	R. C. GAUT, M.Sc., N.D.A.
Instructor in Horticulture	H. PATIENCE

Instructor in Gardening	E. NUTTING†
Instructress in Dairying	Miss E. M. PRITCHARD, N.D.D.
Instructor in Poultry-keeping ..	B. WILCOCK
Manager of Egg Laying Trials ..	R. F. OSBORNE
Instructors in Bee-keeping ..	S. LEEDHAM† G. RICHINGS† J. PRICE† H. E. SCROPE VINER†
Instructors in Pruning and Grafting	J. KITCHING‡ F. A. RATCLIFFE‡ E. CHANCE‡
Instructor in Veterinary Hygiene	J. N. GOLD, M.R.C.V.S.†
Instructor in Hedging	W. RALPHS‡

Yorkshire

(Agricultural Department, University of Leeds)

Professor of Agriculture	R. S. SETON, B.Sc.
Professor of Agricultural Chemistry	N. M. COMBER, D.Sc., A.R.C.S., F.I.C.
Lecturer in Agriculture	G. C. A. ROBERTSON, M.C., M.A., B.Sc.
Assistant Lecturers in Agriculture	H. I. MOORE, B.Sc., N.D.A. T. L. BYWATER, B.Sc., M.S. (Wis.)
District Lecturers in Agriculture..	J. ROBB, B.Sc. J. STRACHAN, M.A., B.Sc., N.D.A. H. THOMPSON, B.Sc. D. H. FINDLAY, B.Sc., N.D.A., N.D.D. W. S. GIBSON, B.Sc. W. E. GELLING, B.Sc., N.D.A. A. B. BATES, B.Sc., N.D.A. W. W. BALLARDIE, B.Sc., N.D.D.
Lecturer in Dairy Husbandry ..	J. MCGREGOR, B.Sc., N.D.A., N.D.D.
Assistant Lecturers in Dairy Husbandry	J. GLEN, B.Sc., N.D.A., N.D.D. Vacant.
Lecturer in Agricultural Chemistry and Advisory Chemist	H. T. JONES, M.Sc.
Assistant Lecturers in Agricultural Chemistry	J. S. WILLCOX, B.Sc., A.I.C. C. E. MARSHALL, M.Sc., Ph.D.
Lecturer in Agricultural Economics	A. G. RUSTON, B.A., D.Sc.
Assistant Lecturer in Agricultural Economics	D. WITNEY, B.Com.
Research Assistant in Agricultural Economics	H. E. NICHOLLS, B.Sc.
Student Assistants in Agricultural Economics	D. C. WITHERS, N.D.A. T. E. MILLER, N.D.A.
Assistant Lecturer (Agricultural Engineering)	I. M. MACKAY, B.Sc., A.I.C.E.
Lecturer in Agricultural Botany and Advisory Mycologist ..	W. A. MILLARD, D.Sc.
Assistant Lecturers in Agricultural Botany	S. BURR, M.Sc. A. POWELL JONES, B.Sc. C. H. CHALMERS, B.Sc., N.D.A.
Demonstrators in Agricultural Botany	Miss D. M. TURNER, B.Sc.
Lecturer in Agricultural Zoology and Advisory Entomologist ..	T. H. TAYLOR, M.A.

Assistant Lecturer in Agricultural Zoology	L. R. JOHNSON, B.Sc.
Lecturer in Veterinary Hygiene	H. G. BOWES, F.R.C.V.S.
Lecturer and Demonstrator in Poultry-Husbandry	C. W. GOODE, N.D.A., N.D.D.
Assistant Lecturers in Poultry Husbandry	Miss M. J. CARTER, B.Sc., N.D.P. Miss I. McL. MILLAR, N.D.P., C.D.P.
Assistant Lecturer in Horticultural Botany	J. GRAINGER, D.Sc.
Instructors in Horticulture	J. W. EVES W. LODGE F. HAWKINS R. DUNCAN Vacant
Instructor in Bee-keeping	W. HAMILTON
Instructresses in Dairying	Miss H. CRAWFORD, N.D.D. Miss E. M. CROSSLEY, N.D.D.
Instructress in Rural Domestic Economy	Miss W. E. JOLLY, D.S.D.
Bailiff at Askham Bryan	C. M. KNIGHT

Members of other Departments giving instruction to students in Agriculture.

Agricultural Geology	R. G. HUDSON, M.Sc.

WALES AND MONMOUTHSHIRE

Anglesey

Agricultural Organizer	GRIFFITH JONES, B.Sc., N.D.D.*
Instructor in Horticulture	W. G. WILLIAMS
Instructress in Dairying and Poultry-keeping	Miss JENNIE JONES, N.D.D.
Manageress of Incubating Station	Miss M. STANTON

Breconshire and Radnorshire

(Joint Staff)

Agricultural Organizer	DAVID THOMAS, Dip.Agric.
Assistant Agricultural Organizer	WM. EVANS, B.Sc., N.D.A., N.D.D.
Instructor in Horticulture and Bee-keeping	J. G. WATSON, F.R.H.S.
Instructress in Dairying and Poultry-keeping	Miss E. JONES, N.D.D.

Caernarvonshire

Madryn Castle Farm School Staff

Principal and Agricultural Organizer	ISAAC JONES, N.D.A., N.D.D.
Assistant Organizer and Lecturer in Agriculture	EDWIN JONES, M.Sc.
Instructor in Horticulture	J. ROBERTS
Instructress in Dairying	Miss M. ROBERTS, N.D.D.
Instructor in Poultry-keeping	H. R. JENKINS, N.D.P.
Instructor in Veterinary Hygiene	G. J. ROBERTS, F.R.C.V.S.†
Instructor in Bee-keeping	J. ROWLANDS, B.B.K.A.

Cardiganshire

Agricultural Organizer	D. J. MORGAN, B.Sc.
Instructor in Horticulture	W. LEWIS, F.R.H.S.
Instructress in Dairying	Miss R. M. EVANS, N.D.D.
Instructor in Poultry-keeping	H. POWEL EVANS

Carmarthenshire

Pibwrlwyd Farm Institute Staff

Principal of Farm Institute and Agricultural Organizer	J. L. LLOYD, M.Sc., A.I.C., F.I.H.
Vice-Principal	A. D. THOMAS, B.Sc.
Instructor in Horticulture	W. ROADLEY
Instructress in Dairying	Miss M. A. V. GRIFFITHS, N.D.D.
Instructress in Rural Domestic Economy	Miss E. K. MORGAN
Instructor in Poultry-keeping	J. B. MORRISON, N.D.P.
Instructor in Veterinary Science	T. R. THOMAS, M.R.C.V.S.†

Denbighshire

Llysfasi Farm Institute Staff

Principal and Agricultural Organizer	ISAAC JONES, B.Sc.
Instructor in General Science	E. DAVIES, B.Sc.
Instructor in Horticulture	CHAS. ROBERTS, F.R.H.S.
Instructress in Dairying	Miss A. DAVIES, N.D.D.
Assistant Instructress in Dairying	Miss E. M. LLOYD, N.D.D.
Dairymaid	Miss M. E. DAVIES
Instructor in Poultry-keeping	L. C. S. ROSS
Instructor in Veterinary Hygiene	J. H. WYNNE, F.R.C.V.S.†
Instructor in Farriery	E. G. PARRY†
Instructor in Joinery	S. PRICE†
Recorder	A. E. JONES

Flintshire

Agricultural Organizer	W. E. LLOYD, M.Sc.
Horticultural Superintendent	H. L. JONES, N.D.H., Exp. B.B.K.A.
Instructress in Dairying	Miss R. A. DAVIES, N.D.D.
Instructor in Poultry-keeping	H. E. DAVIES
Assistant in Poultry Department	J. S. ROBERTS
Head Gardener	R. J. EDWARDS

Glamorganshire

Director of Agriculture and County Organizer	J. D. DAVIDSON, A.R.C.Sc.I., N.D.A., N.D.D.
Assistant Agricultural Organizer and Instructor in Agriculture	J. DAVIES, B.Sc.
Instructor in Agriculture	E. O. JAMES, B.Sc.
Technical Assistant	CYRIL KINSEY, N.D.A.
Instructor in Veterinary Hygiene	D. E. DAVIES, M.R.C.V.S.
Instructor in Agricultural Economics	E. LL. HARRY, M.Sc.
Horticultural Superintendent	E. W. WITHERS
Horticultural Instructors	A. D. HARRISON, N.D.H. C. R. S. GREGORY, N.D.H.
Instructor in Poultry-Husbandry	WM. EVANS, N.D.P.
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PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

The Horticultural College, Swanley, Kent

The following changes are notified :—

Miss H. C. Jameson has been appointed Secretary, *vice* Miss E. Lucas, resigned.

Miss E. G. Woodcock, N.D.D., B.D.F.D., has been appointed Farm Forewoman and Dairy Instructress, *vice* Miss D. Postlethwaite, resigned.

Miss A. C. Anderson, N.D.A., N.D.D., has been appointed Assistant Farm and Dairy Instructress, *vice* Miss S. St. John, resigned.

Studley College, Warwickshire

The following change is notified :—

Miss Jean W. T. Kay, N.D.P., has been appointed Lecturer in Poultry-Husbandry, *vice* Miss Pringle, N.D.D., resigned.

STAFFS OF AGRICULTURAL RESEARCH INSTITUTES

Rothamsted Experimental Station

Dr. C. B. Williams, Lecturer in Agricultural and Forest Zoology, University of Edinburgh, has been appointed Chief Entomologist, *vice* Dr. A. D. Imms who has been appointed Head of the new Department of Entomology, University of Cambridge.

* * * * * *

NOTICES OF BOOKS

The Supply Area of the Chicago Livestock Market. By E. A. Duddy, Associate Professor of Marketing, University of Chicago, and D. A. Revzan, Research Assistant. Pp. xi + 100. (London : Cambridge University Press. Price 4*s*. 6*d*.)

The authors of this "Study in Business Administration" justly claim that the Chicago Livestock Market, the central livestock market in the United States, is unique. Large numbers of animals are concentrated from a wide producing area at a single trading centre. Sale by the farmer takes place, not in the country, but after the animals have arrived at the market. The animals are disposed of either to the packer for slaughter, or to the feeder for return to the country, or to a shipper for reshipment to eastern slaughter points.

The receipts of livestock at Chicago are the largest of any market in the United States. Chicago received 17·88 per cent. of the total cattle receipts for 1923-1929 at the 17 principal markets. The corresponding figure for calves was 11·67 per cent., for pigs 18·51 per cent., and for sheep and lambs 16·90 per cent. Approximately a quarter of these receipts are reshipped elsewhere, either to packing houses at a distance, or to the country for further feeding. It would appear, however, that not more than about 6 per cent. of cattle are thus sent back to the country and about 15 per cent. of sheep and lambs. It is interesting to note that, although Chicago does not receive more than one-fifth of the livestock of the country, it is stated to provide a price basis on which trading in livestock is carried on throughout the country. A similar effect is undoubtedly noticeable in the influence of Smithfield on the general livestock prices in England and, still more, of La Villette on French livestock prices.

The principal topics discussed in the book are the areas for different kinds of livestock from which Chicago draws its supplies, the stability of receipts, the types of marketing movement, the seasonal receipts of livestock and the seasonal competition of the markets.

The main tendency in marketing livestock in the United States appears to be greater concentration at local markets, partly due to a relatively high freight tariff, partly to improved motor transport facilities, and partly to the growth of local packing plants. This development seems to be counteracted to some extent by the reshipment of cattle from local markets either direct to packers or for resale in the Chicago market itself.

A point of some interest is the average weight of the livestock received at Chicago. It is stated that the market is known as a market for heavy-weight, well-finished beeves, but the average weights are only from 950-1,000 lb., *i.e.*, rather under 9 cwt., while sheep and lambs average 70-80 lb. per head, and pigs about 237 lb.

The Waste Products of Agriculture. By A. Howard, C.I.E., M.A., and Y. D. Wad, M.Sc. Pp. xiv + 167. Illus. (London: Humphrey Milford; Oxford: University Press. 1931. Price 7*s.* 6*d.*)

Farmers all over the world are well aware of the importance of organic matter in maintaining soil fertility, but it is in the East that the full utilization of all sources of organic matter, both animal and vegetable, has been brought to the greatest perfection. In China and Japan nothing is wasted, every kind of "waste" material produced on the farm being carefully composted and returned to the soil. Cultivators in these countries have known for centuries that a preliminary rotting of organic matter outside the soil is essential in order to derive immediate benefit from its use. It is only recently that, with the application of micro-biology to agricultural problems, the reason for this has been clearly brought out, and the conditions underlying the decay and humification of organic matter have been discovered. Recognizing the soundness of the ancient practice of Eastern farmers, and armed with the new biological and chemical principles, the authors have developed on the experimental farm of the Institute of Plant Industry at Indore, India, a system of composting crop residues and waste organic material in general and returning them to the land in the form of a finely-divided organic manure.

The work of Hutchinson and Richards at Rothamsted showed that air, moisture, a sufficient supply of nitrogen and a neutral reaction were the conditions for the decay of organic matter by the agency of micro-organisms. This is the basis of the well-known "Adco" process that is being much used at home and abroad on a wide range of waste organic materials. In the Indore process the neutral reaction is produced by the use of the ashes of such organic matter as is burnt for fuel, while the nitrogen is obtained by the use of cow dung, earth soaked with urine from under the cattle, and the inclusion of wastes containing a high proportion of nitrogen such as leguminous residues. Watering and turning are carried out systematically, and new composts are inoculated with active material from older heaps. The detailed management of compost heaps is clearly described, and the proportions of the various ingredients that have been found to give a satisfactory product are stated. Many data are given as to the nitrogen balances of compost heaps and their intensity of fermentation under various systems of management and climatic conditions. The amount of labour involved in the making of these composts is large, but this is no drawback where labour is plentiful and money for the purchase of fertilizers is scarce. The authors claim that the system as they have worked it out is adapted for use in most tropical countries. Where sufficient cattle are not kept some outside source of nitrogen such as the "Adco" reagent will probably be necessary, while in colder districts shelter of the heaps may be required to maintain the high temperature necessary for rapid fermentation. Where labour is scarce the problem is more difficult, and investigation into the mechanization of the process would be desirable.

In farming systems on the continent of Europe, farmyard manure is the basis of the supply of organic matter, and the use of artificials is definitely established. There are still, however, a number of crop residues that do not find their way into the manure heap, and the

reader of this book will wonder whether some of this material could not be utilized with advantage either by the existing process or by some suitable modifications of the methods there described. At Rothamsted long-period field experiments are in progress to test Adco manure against alternative methods of providing organic matter for the soil. It is to be hoped that the products of the Indore system will be similarly tested.

The book is well written and illustrated, and forms a real addition to the literature of an interesting and important subject.

Progress in English Farming Systems. VI—High Farming. By C. S. Orwin. Pp. 24. (Oxford: Clarendon Press. London: Humphrey Milford, Oxford University Press. 1931. 1*s*.)

This report is the sixth of a series of studies of farming achievements representing departures from accepted local practice. It concerns the practice of Mr. A. H. Brown, of Hayling Island, a tract of alluvial land separated from the mainland off Portsmouth by a mud flat submerged at high water. The land in Mr. Brown's occupation extends to 468 acres of which 218 acres are grass and 250 acres are arable. Part is owned and part rented.

The main objects of the farming are milk production and the cultivation of saleable crops. One hundred head of dairy stock are maintained for the sale of milk to Portsmouth. In addition there are about 1,700 head of poultry and a few pigs. The equipment includes milking machines, two tractors and tractor implements. Nine horses are employed together with a staff consisting of two tractor men, three carters, six cowmen, seven labourers and 1 poultryman. Mr. Brown is assisted in the management by his brother.

The author is well known as an enthusiastic advocate of specialization, a term that is defined in this report as concentration on the production of (1) one commodity, *e.g.*, milk from grass or from grass and arable crops, or (2) groups of commodities, *e.g.*, arable crops or market garden crops without dependence upon animal husbandry, or (3) both crop and animal products, the farm being arranged as "a group of specialized businesses, each one organized with the maximum of economy, and virtually independent of the rest."

Specialization, as so defined, is said to be an alternative to the ancient practice of mixed farming that is responsible for the greatest degree of depression in the industry to-day.

Mr. Brown's system is evidently an example of the form of specialization (3), for "The two businesses, dairying and crop production, are carried on . . . as two entirely separate things. There is no interchange of labour, even at milking time or at harvest time . . ." It is pointed out, however, that 10 acres of mangolds and green stuff are grown for the cows, otherwise the arable land is cropped for market, with artificials. Presumably no straw is used for litter. Likewise, it is to be inferred that hay-making, so far as the cows' requirements are concerned, is undertaken by the dairy staff, and "seeds" hay-making, for sale, by the arable staff. One is left wondering as to the disposal of such by-products as "tail" corn, beet-tops and small potatoes.

To the author, sheep-folding, dung, rotational cropping and interchange of labour are anathema; consequently Mr. Brown scores full marks because he renounces sheep (on heavy low-lying land!), "throws" rotations "to the winds," dung on the nearest paddock, and departmentalizes. Even "traditional" farmers will be surprised to learn that they still adhere closely to rotations and sheep-folding. As for dung, the majority, having gone to the trouble of loading it, will probably continue to throw it where it is likely to do most good. Further, until men can be "stood off" when not required, farmers

will probably continue so to regulate their business as to provide year-round productive work in whatever department it is to be found.

Whether or no Mr. Brown's farming system differs greatly from that adopted by many other farmers is of little consequence. It is clear from the financial data adduced, albeit somewhat meagre, that he has succeeded in evolving a system admirably adapted to his own particular circumstances.

Although the argument for specialization is, perhaps, a little over-strained, the report makes stimulating reading and is well worth the attention of all interested in the development of British agriculture.

* * * * * *

SELECTED CONTENTS OF PERIODICALS

Plant Pests and Methods of Control

Notes on the Outbreak of the Cabbage Aphid (*Brevicoryne brassicae* Linn.) in 1929. *H. F. Barnes.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 178-180.) [63.27.]

Observations on Gall Midges affecting Fruit Trees. *H. F. Barnes.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 170-177.) [63.27.]

Some Observations on Winter Moth Caterpillar Attack on Fruit Trees in 1929-30. *S. G. Jary.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 137-146.) [63.27.]

A Note on the Strawberry and Raspberry Bud Weevil, *Anthonomous rubi* (Herbst). *S. G. Jary.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 147-152.) [63.27.]

A Contribution to the Biology of the Apple Capsid (*Plesiocoris rugicollis* Fall.) and the Common Green Capsid (*Lygus pabulinus* Linn.) *M. D. Austin.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 153-169.) [63.27.]

Notes on Unusual Pest Occurrences in 1930. *H. W. Thompson.* (Welsh Jour. Agric., VII (1931), pp. 358-363.) [63.27.]

The "Many-Necked" Condition of Swedes in Relation to Varietal and Manurial Trials. *W. M. Davies.* (Welsh Jour. Agric., VII (1931), pp. 319-332). [63.27; 63.332.]

Trials on the Control of Certain Horticultural Pests in North Wales. *W. M. Davies.* (Welsh Jour. Agric., VII (1931), pp. 332-349.) [63.27.]

Notes on some Agricultural and Horticultural Pests in the Bristol Province. I: The Beet Carrion Beetle (*Blitophaga opaca*) and its Control. *L. N. Staniland* and *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 72-74.) [63.27.]

Notes on Some Agricultural and Horticultural Pests in the Bristol Province. II: A Case of Sainfoin Midge (*Contarinia onobrychidis* Kieff) in Wiltshire. *L. N. Staniland* and *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 74-75.) [63.27.]

Notes on Some Agricultural and Horticultural Pests in the Bristol Province. III: Notes on a Serious Tomato Pest (*Scutigerella immaculata*). *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 76-78.) [63.27.]

Observations on Capsid Bug Control by Means of "High Neutral" Tar Distillate Washes in 1930. *L. N. Staniland* and *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 79-94.) [63 295; 63.27.]

A Note on the Control of Woolly Aphis on Dormant Nursery Stock. *L. N. Staniland* and *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 106-107.) [63.27.]

The Control of *Galerucella lineola*—a Major Pest of Willows. *H. P. Hutchinson* and *H. G. H. Kearns.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 108-111.) [63.27.]

The Control of *Phyllodecta vitellinae* L. (*Chrysomelidae*). A Major Pest of Willows. *H. P. Hutchinson* and *H. G. H. Kearns.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 112-126.) [63.27.]

Examination of Plants for Insecticidal Principles. II: Elecampane. *F. Tutin.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, p. 71.) [63.295.]

The Preparation of Oil Sprays. I: The Use of Oleic Acid as Emulsifier. *H. Martin.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 181-187.) [63.295.]

The Effect of Ultra-Violet Light Radiations on the Vegetative Growth of Wheat Seedings and their Infection by *Erysiphe graminis*. *G. L. Hey* and *J. E. Carter.* (Phytopathology, 21, 6 (June, 1931), pp. 695-699.) [537 ; 63.24 ; 63.295.]

Observations of Many Hosts of Dodder (*Cuscuta epithymum* Murray) in Kent, and a Record of a Variety New to Britain. *R. M. Harrison.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 300-303.) [63.259.]

Live Stock and Feeding

Development of Stock Farming in Scotland since the Establishment of the Highland Society in 1784. *J. B. Orr.* (Trans. Highl. and Agric. Soc. of Scotland, 5th Ser., Vol. XLIII (1931), pp. 44-59.) [63.6(41).]

Cattle Feeding: Swedes versus Potatoes for Beef Production. *W. G. R. Paterson.* (Trans. Highl. and Agric. Soc. of Scotland, 5th Ser., Vol. XLIII (1931), pp. 86-99.) [63.62 : 043.]

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The Value of Tapioca Flour and Sago Pith Meal in the Nutrition of Swine. *H. E. Woodman, A. W. Menzies Kitchin* and *R. E. Evans.* (Jour. Agric. Sci., XXI, 3 (July, 1931), pp. 526-546.) [612.394 ; 63.60432 ; 63.64 : 043.]

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Present Tendencies in European Pig Production. (Int. Rev. Agric. (Mon. Bull. Agric. Sci. and Pract.), XXII, 6 (June, 1931), pp. 225-233.) [63.64.]

Dairying

The Efficiency of the Milking Machine. *R. Phillips* and *S. B. Thomas.* (Welsh Jour. Agric., VII (1931), pp. 277-290.) [63.713.]

Some Factors Influencing the Keeping Quality of Butter. *S. B. Thomas* and *G. T. Morgan.* (Welsh Jour. Agric., VII (1931), pp. 290-298.) [63.726.]

Guide to the Conduct of Butter Competitions. *S. B. Thomas* and *G. T. Morgan.* (Welsh Jour. Agric., VII (1931), pp. 298-304.) [63.72.]

The Influence of the Fat Content on the Keeping Quality of Milk. *S. B. Thomas* and *H. Jones.* (Welsh Jour. Agric., VII (1931), pp. 304-310.) [63.71 ; 63.712.]

Seasonal Variations in the Bacterial Content and Keeping Quality of Milk. *S. B. Thomas.* (Welsh Jour. Agric., VII (1931), pp. 310-318.) [576.8 : 7 ; 63.71.]

Some Factors of Efficiency in Milk Production. *J. Pryse Howell.* (Welsh Jour. Agric., VII (1931), pp. 19-42.) [63.711; 63.714.]

The Keeping Quality of Afternoon Milk. *H. Barkworth.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 270-272.) [576.8 : 7; 63.71.]

Normal Variations of Keeping Quality. *H. Barkworth.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 273-277.) [576.8 : 7; 63.71.]

Cost Accounts on a Cheese Farm. *J. L. Davies.* (Welsh Jour. Agric., VII (1931), pp. 42-62.) [338.1 (429); 63.714; 63.732.]

Meat

Chemical Changes in the Fat of Frozen and Chilled Meat. Part I. Frozen Mutton and Lamb. *C. H. Lea.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 50, 25 (June 19, 1931), pp. 207T-213T.) [543.1; 664.91.]

Chemical Changes in the Fat of Frozen and Chilled Meat. Part II: Chilled Beef. *C. H. Lea.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 50, 26 (June 26, 1931), pp. 215T-220T.) [543.1; 664.91.]

The Growth of Micro-Organisms on Chilled and Frozen Meat. *R. B. Haines.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 50 27 (July 3, 1931), pp. 223T-227T.) [543.1; 664.91.]

Wool

Types of Wool used in Woollen Factories in Wales. *H. M. Williams.* (Welsh Jour. Agric., VII (1931), pp. 129-134.) [63.761.]

Comparison of Washed and Unwashed Welsh Wool. *R. G. White* and *T. Lewis.* (Welsh Jour. Agric., VII (1931), pp. 134-141.) [63.761.]

Veterinary Science

Summary of Preliminary Investigations on "Struck," an Acute Disease of Sheep. *A. D. McEwen.* (Jour. S.E. Agric. Coll., Wye, 28 (1931), pp. 216-222.) [619.3.]

The Possible Association of the Sheep Nostril Fly (*Oestrus ovis*) with Pneumonia in Sheep. *N. Bissett.* (Welsh Jour. Agric., VII (1931), pp. 363-367.) [59.169.]

A Preliminary Note on the Treatment of Chronic Anæmia Debility in Sheep by Inoculation. *N. Bissett.* (Welsh Jour. Agric., VII (1931), pp. 368-371.) [619.3.]

Cider and Perry

Cider Making Trials for the Season, 1929-30. *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 175-191.) [663.3.]

Cider Making Trials with Nova Scotian Apples. *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 192-194.) [663.3.]

The Effects of Storage Temperature on Cider. II. *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 195-198.) [663.3.]

The Clarification of Ciders by the Centrifuge Method. I. *B. T. P. Barker* and *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 199-204.) [663.3.]

The Prevention of Deposit Formation in Perries. *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 205-208.) [663.3.]

Apple Juice Concentrates. *O. Grove.* (Ann. Rept. Agric. and Hort. Res. Stat., Long Ashton, 1930, pp. 209-214.) [663.2; 663.3.]

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INDEX TO VOL. XXXVIII.

APRIL, 1931, TO MARCH, 1932.

"Notes for the Month" and "Miscellaneous Notes" are indexed under the subjects to which they refer.

PAGE

Acts of Parliament, etc.:
- Agricultural Marketing Act, 1931 .. .. 632, 1028, 1043
- Agricultural Produce (Grading and Marking) Amendment Act 631
- British Sugar Industry (Assistance) Act, 1931 .. .. .. 571, 744
- Bulgaria: Standardization Act 528
- Colorado Beetle (Amendment) Order, 1931 .. .. .. 325, 787
- Destructive Insects and Pests Acts:
  - Fruit Tree Pests (W. Norfolk) Order 331
  - Importation of Cherries Order 338
- Diseases of Animals Acts: Report for 1930 780
- Germany: Grading Act for Agricultural Produce 297, 300
- Horse-Breeding Act, 1918 839
- Horticultural Products (Emergency Customs Duties) Act .. 1099
- Hungary: Standardization Act, 1931 401
- Irish Free State: Agricultural Produce (Potatoes) Act, 1931 .. 834
- Isle of Man: Agricultural Produce (Grading and Marking) Act, 1931 1015
- New Zealand: Dairy Produce Export Control Act 295
- Northern Ireland: Marketing of Fruit Act, 1931 398
- Norway: Marketing Act 75, 296
- Seeds Act, 1920: Working of, during Season 1930–1931 .. 1222
- Wart Disease of Potatoes Order, 1923 1182

Adam, W. B., and F. Hirst: Varieties of Peas for Canning 38

Agricultural Returns and Statistics:
- Agricultural Index Number 115, 215, 325, 439, 557, 671, 771, 868, 958, 1068, 1180, 1278
- Agricultural Returns of England and Wales, 1931 .. 637, 970, 1021
- Agricultural Statistics (Part I), 1930 584
  (Part II), 1930 870
- Guide to Current Official Statistics 463
- Hops, Produce, 1931 970
- International Year Book of Agricultural Statistics 1286
- Sugar-Beet Crop, 1930 129

Agricultural Students, see *Research and Education*.

Agricultural Wages, see *Wages*.

Agriculture:
- Central Chamber of: Minister's Address to 1195
- Council of, for England, see *Council*.
- Government Policy: Minister's Statements 1193
- In Russia 243
- Reducing Costs of 569

Allotments, see *Small Holdings and Allotments*.

Animals, see *Diseases and Pests of Animals* and *Livestock*.

Apples, see *Fruit*.

Appointments:
- Changes and Corrections: 119, 221, 334, 453, 460, 677, 774, 874, 971, 1298
- List of County Agricultural Staffs: England 1186, 1288
  Wales 1296

Argentina: Regulation of the Importation of Eggs 1016

Arkwright, J. A.: Recent Research in Foot-and-Mouth Disease .. 1207

Ashby, A. W., and S. T. Morris: A Remarkable Smallholding in South Wales 814

Austin, M. D.: Control of Apple Capsid 154

Austria: Equalization Fund for Milk 741

Bacon, see *Meat*.

Baker, M., and F. Howard Lancum: Wood Pigeons 599

Barley: Prices of, see *Prices*.
- Tasmanian Growers Marketing of 634

PAGE

Bartlett, S.: Nutritional Value of Raw and Pasteurized Milk .. 60
Basic Slag, see *Manures.*
B.B.C. Talks on Pig-Keeping 254, 355, 482
Beef, see *Marketing.*
Bees:
Canada: Grading and Marking of Honey 527
Marketing of Home-Produced Honey 404, 414
Standard Packages for Honey 71
Beet, see *Sugar Beet.*
Belgium: National Mark Eggs 533
Bermuda: Colonial Mark for Fruit and Vegetables 191
Birds:
British Woodpeckers 147
Economic Ornithology 705
Food and Feeding Habits of the Land-Rail or Corn-Crake .. 618
Wood Pigeons 599
Broadcasting: B.B.C. Talks on Pig-Keeping 254, 355, 482
Brown, C. A. Cameron: Use of Electricity in Horticulture .. 132
Bryce, J.: Plantings of Rice Grass in Essex 801
Bulgaria: Standardization Act 528

Canada, see also *Marketing.*
Agricultural Machinery in 10
Canham, A.: South African Farmers' Tour of Great Britain 573
Canning, see *Fruit* and *Vegetables.*
Carabid Beetles as Strawberry Pests in the Cheddar District 373
Cattle, see *Live Stock.*
Cereals:
Barley Prices and Supplies, see *Prices.*
Cereals after Ley 755
Cereals and Hay for Stock Feeding. 764
Corn Harvest 547
Maize Control in Southern Rhodesia 836
Maize Prices and Supplies, see *Prices.*
Malt Products, National Mark, see *Marketing.*
Nitrogen for Cereals 97
Norway: State Grain Monopoly 533
Oats for Baby Beef Feeding 994
Oats Prices and Supplies, see *Prices.*
South African Grain Pool 527
Varieties for Autumn Sowing 575
Varieties for Spring Sowing 1094
Wheat: Analysis and Baking Qualities of All-English Yeoman 1145
Home-grown Quota Proposals 412, 1098, 1197
International Conference 259
National Mark Flour, see *Marketing.*
Prices and Supplies, see *Prices.*
Chadbourne, T. L.: World Cures for the World's Economic Ills .. 742
Cider, see *Marketing.*
Clover, see *Pasture.*
Colleges, Research Stations, etc., see also *Conferences and Congresses.*
County Farm Institute Courses 673
Harper Adams Agricultural College, County Poultry Instructors' Course 329
National Institute of Agricultural Botany 575, 1094
Reports of Agricultural Research Institutes, 1929–30 353
Royal Veterinary College 411
Collinge, W. E.: Food and Feeding Habits of the Land-Rail or Corn-Crake 618
Commissions, Committees and Councils, see also *Council of Agriculture.*
Agricultural Machinery Testing Committee 686, 965
Commission on Tropical and Sub-Tropical Agriculture 983
Economic Advisory Council: Sixth Report on Mineral Content of Natural Pastures 2

Commissions, Committees and Councils: *(continued)*	PAGE
Foot-and-Mouth Disease Research Committee: Fourth Progress Report	1207
Soils Correlation Committee	1206
Competitions:	
Clean Milk	785, 1135
Farm Institute Live Stock Judging	443
National Mark Flour Cookery	72, 739
Young Farmers' Clubs: International Dairy Cattle Judging	464
Composition of Kitchen Waste	366
Conferences and Congresses:	
Agricultural Meteorological Conference	468
Empire Wool Conference	926
Field Experiments, Conference on Technique	233
Grey Squirrels, Conference on	242
International Association of Plant Breeders	488
International Dairy Congress, Copenhagen, 1931	445, 572
International Rabbit Breeders' Congress	956
International Wheat Conference, Rome	259
Midland College Poultry Conference	675
Mechanized Farming Conference, Wye	235
Power Farming Conference, Rothamsted	1200
Winchester	980
Rabbit Conference, Harper Adams College	468
Seed Analysts' Conference	324
Sheep-Breeding Conference	121
Welsh Sheep Conference	889
Co-operation, see also *Young Farmers' Clubs.*	
Management of Co-operative Marketing Organizations	76
Marketing of Poultry Produce in Germany	78
Corn, see *Cereals.*	
Costings, see *Farm Values.*	
Council of Agriculture for England:	
Agricultural Marketing Act, Report of Standing Committee, 1931	1043
Barley Quota	1038
Barley, Tax on Imported Malting	1037
County Agricultural Education Services	1029, 1044
Development of Pig Industry	1029
Grey Squirrel Damage	410
Import Duties on Milk, Milk Products, Eggs and Manufactured Food Products	1038
Law Relating to the Sale of Milk	405
Marketing of Home-Produced Honey	404, 414
Marketing of Sheep, Mutton and Lamb	1028, 1039
Marking Imported Potatoes	1033
Milk: Reorganization Commission	1034
National Mark Progress	407
Preparation of Fruit for Market	409
Reports of Meetings	404, 1026
Royal Veterinary College	411
Sale of Fat Cattle	410, 419
Tariffs on Dumped Produce	1039
Wheat: Price of, and Cost of Loaf	1036
Wheat Quota	412, 1034, 1038

Dairying: see also *Competitions, Feeding and Feeding Stuffs,* and *Marketing.*	
Butter, Goats'	731
Butter Prices and Supplies, see *Prices.*	
Cheese: Goats'	731
Prices and Supplies, see *Prices.*	
Rusty Spot in	881
Standardization in Bavaria and Würtemberg	1150
Concentrated Whey for Growing Live Stock	535

	PAGE
Dairying: (*continued*)	
Dairy Produce, Marketing in New Zealand	295
Dorset Cheese-Making and Milk-Selling Farm	27
International Dairy Congress, 1931	572
Milch Goats	724
Milk:	
For School Children in Leicestershire	594
Law relating to Sale of	405
Nutritional Value of Raw and Pasteurized	60
Prices and Supplies, see *Prices*.	
Supply	1073
Surplus, for Stock Feeding	318
Research	706
Davies, W. Morley: Storage of Sugar Beet on the Farm	806
Dawson, R. B., and T. W. Evans: The Establishment, Maintenance and Renovation of Lawns	711
Denmark:	
Exchange of Danish and British Agriculturists	328
Pig Farming	689
Dinnis, A.: Farming on Borders of Devon and Cornwall	360
Diseases and Pests of Animals:	
Bacillary White Diarrhœa, Laboratory Tests for	465
Foot-and-Mouth Disease 119, 221, 331, 452, 559, 677, 774, 873, 972, 1185, 1207	
Recent Research in	1207
Rabbits, Some Diseases of	348
Research into Swine Diseases, Report	603
Warble Flies	1089
Diseases and Pests of Plants:	
Apple Capsid Control	154
Basket Willows, Diseases and Pests of	871
Bulb Flies on Narcissus	54
Cabbage Root Fly	1230
Carabid Beetles as Strawberry Pests	373
Celery Diseases	7
Colorado Beetle	325, 787
Downy Mildew on Lettuce	998
Finger and Toe (Club Root)	272
Frit Fly	1262
Grey Squirrel: Damage by	410
Insect Pests	203
Potato Blight	346
Slugs and Wheat	984
Wart Disease Immunity Trials	1184
Wart Disease Order, 1923	1183
Wireworm	1262
Drainage and Reclamation:	
Drainage in the Great Ouse Catchment Basin	893
Mole Drainage Demonstrations, 1932	978, 1093, 1206
Rice Grass Experiments	705, 798
Dudley, F. J.: Estimation of Yield of Sugar-Beet	494
Economy of Washing Kent Sheep before Shearing	151
Education and Research, see also *Colleges*:	
B.C.G. Vaccine Investigation	702
Breeding of Pedigree Grasses	703
Brewing Research	334
Course in Tropical Agriculture	768
Dairy Research	706
Department of Animal Pathology	704
East Malling Research Station	704
Economic Ornithology	705
Empire Marketing Board Research Grants	702
Exchange of British and Danish Agriculturists	328
Humbert-Marie José Prize	112
Imperial Bureau of Plant Genetics	138

	PAGE
Education and Research: (*continued*)	
Instruction in Clean Milk Production	1135
Lawns, Establishment, Maintenance and Renovation	711
Lectures in Tropical Hygiene	441
Methods of Soil Analysis	705
National Diploma and Fream Memorial Prize	327
Ormskirk Potato Trials	349
Prize for Improving Agriculture in the Punjab	446
R.A.S.E. Research Medal	445
Recent Research into Foot-and-Mouth Disease	1207
Refresher Course for County Poultry Instructors	329, 871
Research into Swine Diseases	603
Rice Grass Experiments	705
Rothamsted Field Experiments	233
Rothamsted Winter Lectures	768
Scholarships: Agricultural	111
Agricultural and Veterinary Research	110
For Agricultural Workers' Children	109
Post Graduate	770
Travelling	1071
United Dairies	667
Seed-Testing Course and Examination	324
Sheep Feeding Experiments	433
Special Research Grants	770
Stored Products Research	703
Travelling Research Fellowships	110
Virus Diseases of Plants	703
Wild Rodents Research	705
Edwards, E. E.: Cabbage Root Fly and Methods for its Control	1230
Eggs, see *Marketing* and *Poultry*.	
Egypt: Royal Agricultural Museum	571
Electricity, Use in Horticulture	132
Empire Marketing Board, see *Marketing*.	
Engineering, see *Machinery*.	
Ensilage:	
Bulletin	1071
Good Silage *versus* Bad Hay	126
Potato Silage	909
Evans, T. W., and R. B. Dawson: The Establishment, Maintenance and Renovation of Lawns	711
Exhibitions and Shows:	
Agricultural Exhibition at Hanover, 1931	221
Bath and West Show, 1932	1249
Confectioners' and Bakers' Exhibition, National Mark Flour	738
Demonstration of Harvester-Threshers	461, 685
Displays of Home Produce, see *Marketing*.	
Horticultural Machinery Demonstrations	241
Imperial Fruit Show	466, 895
Marketing Demonstrations, see *Marketing*.	
Royal Agricultural Museum of Egypt	571
Summer Demonstrations at Rothamsted and Woburn	219
Visits to Crop Trials	324
Export of Breeding Stock	113, 114, 442, 668, 1281, 1282, 1283
Export Regulations, see *Import and Export Regulations*.	
Farming on the Borders of Devon and Cornwall	360
Farm Notes (Monthly)	91, 200, 313, 429, 547, 653, 753, 850, 939, 1053, 1164, 1262
Farm Values of Feeding Stuffs (Monthly)	107, 213, 323, 437, 556, 664, 767, 865, 954, 1066, 1178, 1277
Featherstone, J. S.: Stack Building and Thatching	264
Feeding and Feeding Stuffs:	
Butter-fat in Milk	1176
Cattle Feeding for Market	1064
Cereals and Hay	764
Concentrated Whey for Growing Live Stock	535
Concentrates for Milk	1065

	PAGE
Feeding and Feeding Stuffs: (*continued*)	
Dairy Cows, Feeding for	1204
Egg Production, Feeding for	319
Fibre in Poultry Feeding	952
Fish Meal	320
Flushing of Ewes	658
Forage Crops	95
Hay, Nutritive Value	860
Lamb, Milk-fed	1272
Milch Goats, Feeding	729
Milk, Concentrates for	1065
Minerals	551
Molassed Beet-Pulp for Milk Production	1114
Monthly Notes on 101, 209, 318, 433, 551, 658, 762, 860, 950, 1063, 1175, 1272	
Nutrition Abstracts and Reviews	459, 1095, 1175
Oil Cakes and Extracted Meals	220
Pig-Feeding in Scandinavia	700, 950
Pigs, Food Requirement of	950
Potatoes for Pigs	764
Poultry-Feeding	660, 903
Prices of Feeding Stuffs (Monthly)	108, 214, 322, 438, 555, 663, 766, 866, 953, 1067, 1179, 1276
Relative Values of Oats-Beet Molasses Pulp and Dried Sugar-Beet Pulp for Fattening Store Cattle	985
Sheep Feeding	433, 658
Solages Method of Forage Preservation	1063
Sugar-Beet Pulp for Baby Beef	993
Supplies and Prices of, Note on	427, 848, 938
Surplus Milk for Stock Feeding	318
Wheat Meal *v.* Millers' Offals as a Pig Food	790
Fertilizers, see *Manures.*	
Fisheries: New Fishery Research Vessel	347
Fishwick, V. C.: Rearing Sucking Pigs	898
Foot-and-Mouth Disease, see *Diseases and Pests of Animals.*	
France, Proposed National Mark for Agricultural Products	740
Fruit: see also *Cider* and *Marketing.*	
Apples: Bramley's Seedling	570
Cold Storage of	585
Blackcurrant Bushes, Inspection of	170
Canning Industry and Agriculture	74
Canning Plant at Maidstone	822
Fruit Tree Pests Order	331
Growing Areas of, in Old Red Sandstone	686
Growing in Cheshire	1101
Imperial Fruit Show	466
Preparation for Market	409
Strawberry Plants, Inspection	170
Fussell, G. E.: Grassland Advice in the Mid-Eighteenth Century	607
Gardner, H. W., and J. Hunter-Smith: Sugar-Beet Pulp for Baby Beef	993
Garner, F. H., and H. G. Sanders: Sulphuric Acid Treatment of Sugar-beet Seed	8
Garner, F. H., H. E. Woodman and W. S. Mansfield: Relative Values of Oats, Beet-Molasses Pulp and Dried Sugar-Beet Pulp for Fattening Store Cattle	985
Garner, H. V.: Field Experiments, Conference on Technique of	233
Monthly Notes on Manures 95, 204, 756, 855, 944, 1057, 1168, 1266	
Sheep-Breeding Conference, Rothamsted	124
Germany:	
Agricultural Publicity	1016
Agricultural Students' Tour in England	75
Cheese Standardization in Bavaria and Würtemberg	1150
Grading Act for Agricultural Produce	297
Grain Trade Society	1015

Germany: (*continued*) PAGE
Need for Standardization 529
Peas, Standardization and Sale 923
Publicity for Butter.. 635
Rationalization of Dairies 187
Goats:
Housing 115
Management of Milch 724
Stud Scheme.. 111
Welsh Breeders' Association 329
Grading, see *Marketing.*
Grass, see *Pasture* and *Seeds.*

Hall, Sir Daniel: B.B.C. Talks on Pig-keeping 254, 355, 482
Harding, L.: Concentrated Whey for Growing Live Stock 535
Hargreave, J., and Brynmor Thomas: Composition of Kitchen Waste 366
Hay Crops 200, 313
Hirst, F., and W. B. Adam: Varieties of Peas for Canning.. .. 38
Hodson, W. E. H.: New Method of Preventing Attacks of Bulb Flies on Narcissus.. 54
Horticulture, Use of Peat in 474
Hudson, P. S.:
International Association of Plant Breeders 488
Imperial Bureau of Plant Genetics (Crops other than Herbage) 138
Hungary:
National Mark Lard 399
Standardization Act.. 401
Hunter-Smith, J.: Sugar-Beet Pulp for Baby Beef 993
Hygiene, Lectures in Tropical 441

Imperial Bureau of Plant Genetics 138
Import and Export Regulations:
Empire Preference and the Home Producer 1180
Import Duties on Fresh Fruit, Vegetables and Flowers .. 1099
Index Number, see *Agricultural Returns and Statistics.*
India: Prize for Improving Agriculture in the Punjab 446
Insect and Other Pests, see *Diseases.*
Inspection and Certification of Strawberry Plants and Black Currant Bushes 170
Institutes, see *Colleges.*
Irish Free State: Agricultural Produce (Potatoes) Act, 1931 .. 834
Isle of Man: Agricultural Produce (Grading and Marking) Act, 1931 1015

Johnstone, K. H.: Use of Peat in Horticulture 474

Kearns, H. G. H.: Carabid Beetles as Strawberry Pests in the Cheddar District 373

Lancum, F. Howard, and M. Baker: British Woodpeckers.. .. 147
Land Division Report 882
Lawson, W.:
Lucerne 11
Monthly Farm Notes 91, 200, 313, 547, 653, 753, 850, 939, 1053, 1164, 1262
Leaflets, see *Publications.*
Legislation, see *Acts of Parliament.*
Leigh Hunt, S.: Management of Milch Goats 724
Library, Additions to; and Selected Contents of Periodicals 229, 341, 779, 876, 1085, 1302
Lime, see *Manures.*
Line, J.: Weed Form of White Mustard 1091
Live Stock, see also *Diseases and Pests of Animals, Goats, Poultry* and *Rabbits.*
Breeding Problem, Solution of a 793
Cattle Fattening 1054
Cattle Prices and Supplies, see *Prices.*

Live Stock: (*continued*) PAGE
Dairy Cattle Register, Vol. XIV 345
Improvement Scheme Report 499
Lamb Marketing 629
Management and Breeds 361
Pig Farming in Scandinavia 689
Pig Feeding 764
Pig Feeding, B.B.C. Talks 254, 355, 482
Pig-keeping Bulletin 983
Pig-keeping Costs 867
Pig Prices and Supplies, see *Prices*.
Pig Recording and Litter Testing 302
Rearing Sucking Pigs 898
Research into Swine Diseases, Report 603
Sale of Fat Cattle 410, 419
Sheep-breeding Conference 122
Sheep Feeding 433, 658
Sheep, Half-Bred 469
Sheep Marketing 629
Sheep Prices and Supplies, see *Prices*.
Sheep Rearing 1055
Sheep Washing before Shearing 151
Stallions: Licensing under Horse Breeding Act, 1918 839
Young Farmers' Clubs, International Dairy Cattle-Judging Competition 464
Long, H. C.: Weeds of Grass Land.—V 49
Long, W. Harwood: A Study of Six Years' Farming Results in Devon 1119
Potato-Growing in Mid-Devon 1238

Machinery:
Agricultural Machinery in Canada and the U.S.A. 10
Agricultural Machinery Testing Committee .. 583, 867, 965, 1070
Combine Harvesting in 1931 1280
Demonstration of Harvester-Threshers 461
Electricity in Horticulture 132
Fees for Testing Agricultural 4
Horticultural Machinery Demonstrations 241
Harvester-Thresher in England 249
Mechanized Farming, Conference at Wye 235
Rothamsted Conference on Power Farming 1200
Winchester Conference on Power Farming 980
Macpherson, N. J.: Cultivation of Lettuce under Glass with Special Reference to Varieties Resistant to Downy Mildew 998
Maize, see *Cereals*.
Malt, see *Marketing*.
Management of Milch Goats 724
Mansfield, W. S., H. E. Woodman and F. H. Garner: Relative Values of Oats, Beet-Molasses Pulp and Dried Sugar-Beet Pulp for the Fattening of Store Cattle 985
Manures and Manuring:
Ammonia and Nitrates 206
Ammonium Phosphate 97
Arable Cultivation, Rock Phosphate for 1057
Artificial Fertilizers in Modern Agriculture 886
Autumn Manuring 758
Barley, Manures for 1170
Basic Slag 947
Calcium Cyanamide 1168
Coal Ashes 1172
Common Salt 95
Cyanamide on Grass 1060
Farmyard Manure 940
Goat Droppings 731
Lime, Use in Agriculture 955
Monthly Notes on 95, 204, 756, 855, 944, 1057, 1168, 1266
Nitrate of Soda Applied to Sugar-Beet 162

Manures and Manuring: (*continued*) PAGE
Nitrogen for Cereals .. 97
Nitrogen on Grass .. 857
Nitrogen on Sugar-Beet .. 204
Organic Manure for Allotments .. 350
Peat in Horticulture .. 474
Phosphates on Grass .. 945
Prices of Artificial Manures 100, 208, 317, 432, 550, 657, 761, 859, 949, 1062, 1174, 1271
Rock Phosphate in Arable Cultivation .. 1057
Steamed Bone Flour .. 1060
Swedes, Manures for .. 207
Marketing:
Agricultural Marketing Act, 1931 .. 632
Agricultural Produce (Grading and Marking) Amendment Act, 1931 .. 631
Apples, National Mark .. 389, 733, 829, 915
Argentina, Regulation of Importation of Eggs .. 1016
Asparagus, New Method of Marketing .. 293
Austrian Equalization Fund for Milk .. 741
Bacon Control Association in Holland .. 836
Bacon in Norway .. 296, 532
Beef, National Mark 66, 175, 286, 387, 519, 622, 733, 827, 914, 1004, 1140, 1246
Beeswax, Report on Marketing .. 185
Beet-Sugar Industry in Great Britain .. 837
Belgian National Mark Eggs .. 533
Bulgarian Standardization Act .. 528
Butter, Publicity for German .. 635
Canada: Grading and Marking of Honey .. 527
National Mark .. 189
Canned Fruit, National Mark .. 180, 521, 625, 830
Canned Vegetables, National Mark .. 180, 390, 521, 625, 830
Canning Industry and Agriculture .. 74
Cattle, Sale of Gradable .. 68
Cheese, Grading and Marking in South Africa .. 633
Cheese Standardization in Bavaria and Würtemberg .. 1150
Cherries: National Mark .. 177, 390, 522
Order Regulating Importation .. 330
Cider: National Mark 179, 289, 391, 523, 625, 736, 917, 1009, 1018, 1144, 1250
Farm: National Mark .. 1018
Co-operative Marketing Organizations .. 76
Cornwall and Devon Border Markets .. 361
Cucumbers, National Mark .. 178, 288, 389, 521, 1143
Dairy Produce in New Zealand .. 295
Demonstrations 73, 185, 292, 395, 526, 628, 740, 831, 917, 1011, 1145
Devon and Cornwall Border Markets .. 361
Displays of National Mark and Other Home Produce 73, 185. 292, 394, 526, 627, 740, 831, 918, 1011, 1247
Distribution, Modern Tendencies .. 923
Egg & Poultry Co., Ltd., Somerset .. 927
Egg-Packing Station, a National Mark .. 719, 1132
Egg Pool Proposals in Queensland .. 188
Eggs, Belgian National Mark .. 533
Eggs in Norway .. 532
Eggs, National Mark 65, 175, 285, 387, 519, 621, 719, 732, 826, 913, 1004, 1140, 1243
Empire Marketing Board and Agricultural Research .. 702
France, Proposed National Mark for Agricultural Products .. 740
Fruit and Vegetables, Canned, National Mark 180, 390, 524, 625, 736, 822, 830, 916, 1009, 1142, 1246
Colonial Mark in Bermuda .. 191
Fresh, National Mark .. 389, 521, 733, 915, 1007
Marketing Act (Northern Ireland), 1931 .. 398
Proposed National Mark for Home-grown .. 290

Marketing: (*continued*)	PAGE
Fruit: (*continued*)	
New Zealand Dominion Mark for	1251
Portuguese National Mark	533
Proposed National Mark for Bottled	290
German Agricultural Students' Tour in England	75
German Butter, Publicity	635
Germany:	
Agricultural Publicity	1016
Co-operative Poultry Marketing	78
Grading Act for Agricultural Produce	297
Grain Trade Society	1015
Need for Standardization	529
Rationalization of Dairies	187
Standardization and Sale of Peas	923
Grain Pool, South Africa	527
Grants	632
Honey: Grading and Marking in Canada	527
Report on Marketing	185
Standard Packages for	71
Hotels and Restaurants: Use of Home Produce in	1247
Isle of Man: Agricultural Produce (Grading and Marking) Act, 1931	1015
Lamb	629
Lard, National Mark for Hungarian	399
Loans to Co-operative Marketing Enterprises	833
Malt Products, National Mark	179, 1145
Maize Control in Southern Rhodesia	836
Marketing Organization and the Agricultural Crisis	743
Milk in Norway	532
Mutton	629
National Mark and Titles of Companies or Societies	1250
New Zealand: Dairy Produce	295
Dominion Mark for Fruit	1251
Norway:	
Bacon Marketing	296
Marketing of Bacon, Eggs and Milk	532
Milk Marketing	75
State Grain Monopoly	533
Notes (Monthly) 65, 175, 285, 387, 519, 621, 732, 826, 913, 1004,	1140
Olive Oil, Portuguese National Mark	741
Ontario: Suggested Registration of Producers and Agents and Institution of an Ontario Mark	188
"Orange Books" on Marketing	1013, 1151
Pears, National Mark	389, 733, 829
Peas, Standardization and Sale in Germany	923
Plums, National Mark	916, 1009
Portugal:	
National Mark for Olive Oil	74
National Mark Fruit	533
Potatoes Act, Irish Free State	834
Potatoes, Cooking Ware	1148
Potatoes, Grading Ware	293, 834
Potato Marketing, Organization of	920
Poultry Co., Somerset Egg &	927
Poultry, National Mark 65, 288, 387, 521, 732, 827, 1006,	1142, 1249
Poultry Produce: Co-operative Marketing in Germany	78
Publicity for National Mark Produce 71, 183, 290, 392, 521, 626, 736, 831, 918, 1011,	1145, 1247
Queensland: Egg Pool Proposals	187
Roquefort Cheese Industry, Producer-Manufacturer Agreement	402
Sheep	629
Somerset Egg & Poultry Co., Ltd.	927
South Africa: Grain Pool	527
Strawberries, National Mark 177, 289, 390, 521,	1246
Sugar-Beet Industry: Report	395
(Assistance) Regulations	744

Marketing: (*continued*) PAGE
Sugar Beet Industry: Production.. .. .. 922, 1014, 1149, 1250
Sweden: Import Monopoly for Wheat and Rye 1017
Switzerland: National Mark for Agricultural Raw Materials .. 534
Tasmanian Barley Growers' Marketing 634
Tomatoes, National Mark 178, 288, 389, 521, 733, 1143
Union of South Africa:
Grading and Marking of Cheese 633
Grain Pool 527
United States of America: Agricultural Marketing Act: Two Years' Progress 925
Vegetables: Canned, National Mark 180, 390, 524, 625, 830, 916, 1009, 1142
Proposed National Mark for Bottled 290
Ware Potatoes: Cooking 1148
Grading 293, 834
Wheat Flour: National Mark 70, 178, 392, 626, 738, 739, 830, 917, 1010, 1144, 1247
Report on Analysis and Baking Qualities of All-English Yeoman 1146
Wool Conference, Imperial.. 926
World Cures for the World's Economic Ills 742
Market Price, see *Prices*.
Meat: see also *Marketing* and *Poultry*.
Bacon Control in Holland 836
Bacon Prices and Supplies, see *Prices*.
Beef Prices and Supplies, see *Prices*.
Gradable Cattle, Sale by Dead-weight from Farm to Abattoir .. 68
Mutton Prices and Supplies, see *Prices*.
Pork Prices and Supplies, see *Prices*.
Meteorology:
Agricultural Meteorological Conference 468
Weather Forecasts for Farmers 238
Milk, see *Dairying*.
Millington, F.V., Milk for School Children 594
Minchin, Col. A. B.: British Angora Rabbit Industry 351
Mole Drainage, see *Drainage*.
Molyneux, H.: New Systems of Poultry-Feeding 903
Morris, S. T., and A. W. Ashby: A Remarkable Small-holding in South Wales 814

National Mark, see *Marketing*.
New Zealand: Dominion Mark for Fruit 1251
Marketing of Dairy Produce 295
Norfolk Egg Producers, Ltd. 719
Norway:
Bacon Marketing 296
Marketing of Bacon, Eggs and Milk 532
Milk Marketing 75
State Grain Monopoly 533
Notes on Feeding Stuffs, see *Feeding* and *Feeding Stuffs*.
Notes on Manures, see *Manures*.
Notes on Prices and Supplies, see *Prices*.
Notices of Books: see also *Library and Publications*.
Agricultural Atlas of Ireland 1077
Agricultural Atlas of Scotland 680
Agricultural Engineering 563
Agricultural Landowners' Handbook 227
Agricultural Progress 227, 565
Bacteriological Control of Milk 453
Baillière's Encyclopædia of Scientific Agriculture 1082
Beasts and Birds as Farm Pests 975
Bee-keeping, New and Old.. 337
Bibliography of History of Agriculture in U.S.A. 335
Chemistry and Chemical Technology of Animal Substance .. 1080
Classified List of Daffodil Names.. 565

Notices of Books: (*continued*) PAGE
Complete Book of Gardening 226
Co-operation in Danish Agriculture 974
Corrosion of Tin Plate Container by Food Products 338
Country Life of the Nation.. 226
Dairy Farming in the Blackmore Vale 778
Economic and Financial Analysis of East Anglian Farm .. 680
Economic and Social History of an English Village 560
Economic Survey of Hertfordshire Agriculture 1077
Education in Rural Wales 228
Elements of Practical Statistics 566
Environment and Plant Development 566
Eugenics Review 453
Factors affecting Prices of Live Stock in Great Britain .. 875
Farmers' Business 875
Farm Management Research Technique 1081
Farm Weeds 120
"Feathered World" Year Book 337
Field Experiments in Horticulture 568
Five Years' Work at the Hertfordshire County Laying Trials .. 567
Gardeners' Year Book 336
George Washington and Agriculture 887
Grey Squirrel.. 1076
Honeycraft in Theory and Practice 1081
Hortus: A Concise Dictionary of Gardening 974
Husbandry 228
Insects and Climate.. 564
Intensive System of Poultry-keeping 228
International Institute of Agriculture 978
Introduction of Farm Machinery in U.S.A. 1078
Journal of National Institute of Agricultural Botany 337
Journal of the Wiltshire Association of Dairy Students .. 564
Land Drainage Act, 1930 120
Land Value Tax, 1931 1082
Maize in South Africa 561
Manor Farm 973
Manual of Fruit Cultivation on a Physiological Basis 874
Marketing of Farm Produce, Part III: Hops 561
Marketing of Fruit and Vegetables in the Vale of Evesham .. 561
Microscopic Examination of Cattle Foods 225
Midlands Grazing Industry.. 679
National Farmers' Union Year Book 336
Oil Cakes and Extracted Meals 220
Pig Breeders' Annual, 1931.. 564
Physical Properties of the Soil 777
Plant Quarantine and Control Administration 222
Principles of Dairying 874
Principles of Farm Mechanics 227
Principles of Plant Biochemistry 339
Progress in English Farming Systems.—V 566
VI 1301
Rabbits, 1931 674
Range Cattle Industry 224
Range Sheep and Wool in Western America 678
Reclamation of Land from the Sea 563
Relationship between Experimental and Demonstration Plot.. 339
Report on Marketing of Honey and Beeswax 185
Report on Mineral Content of Natural Pastures 2
Role of Atomic Energy in Nutrition 678
Russian Agriculture during the War 223
Scientific Aspects of Rabbit Breeding 1084
Soil and the Microbe 976
Soil: An Introduction to Scientific Study of the Growth of Crops 1083
Soils of Berkshire 1084
Some Aspects of Meat Distribution and Consumption 1083

Notices of Books : (*continued*) PAGE
Supply Area of Chicago Livestock Market 1299
Text-book of Agricultural Entomology 340
Tin Plate Decoration and Lacquering of Food Containers .. 337
University of Cambridge Institute of Animal Pathology Report 1079
Use of Fertilizers in Tropical and Sub-Tropical Agriculture .. 1081
Vegetable Industry 974
Waste Products of Agriculture 1300
Weekly Weather Report 1081
Welsh Journal of Agriculture 778
West of Scotland Agricultural College : Former Students' Club Journal 228
Woad Plant and Its Dye 567

Oats, see *Cereals* and *Prices*.
Oldershaw, A. W. :
Good Silage *versus* Bad Hay 126
Grass Mixtures 580
Oliver, F. W. : Plantings of Rice Grass in Holland 798

Parkhurst, R. T. : Range Shelters for Young Poultry 612
Pasture :
Early Grass 93
Farmers' Grazing Problems 981
Grassland Advice in the Mid-Eighteenth Century 607
Grass Mixtures 580
Imperial Bureau of Plant Genetics (Herbage Plants), Aberystwyth 142
Lucerne 11
Mineral Content of Natural Pastures 2
Pasture in August 549
Reclamation of Poor Pasture 852
Rough and Hill Grazings, Improvement of, I. and II. .. 1109, 1215
Wild White Clover 6, 1205
Peas, see *Vegetables*.
Peat, Use, in Horticulture 474
Pests, see also *Diseases*.
Grey Squirrels, Conference on 242
Musk-Rat Danger 7
National Rat Week 684
Rats, and How to Exterminate Them 465, 685
Wild Rodents Research 705
Pigs, see *Live Stock*.
Plant Diseases, see *Diseases of Plants*.
Portugal :
National Mark for Olive Oil 741
National Mark Fruit 533
Potatoes, see also *Diseases and Pests of Plants* and *Marketing*.
Blight 346
Cooking Quality of Ware 1148
Grading of Ware 293, 834
Growing in Mid-Devon 1238
Irish Free State : Agricultural Produce (Potatoes) Act, 1931 .. 834
Marketing Organization 920
Ormskirk Trials, 1931 349
Pig Feeding 764
Prices and Supplies 89, 313, 752, 937, 1050
Scotland : Acreage, 1931 964
Seed 1226
Silage 909
Poultry, see also *Marketing*.
County Egg-Laying Trials : Millers' Mutual Association Cup .. 239
County Instructors' Refresher Course 329
Dressed, National Mark 65, 288, 387, 521, 732, 827, 1006, 1142
Egg-Laying Trials in Bedfordshire 1029-30 130
Egg Prices and Supplies 545, 847
Egg Production, Feeding for 319

Poultry: (*continued*) PAGE
Feeding Experiments 660
Laboratory Tests for Bacillary White Diarrhœa 465
Midland College Conference 675
New Systems of Poultry-Feeding 903
Poultry and Goats 731
Poultry-keeping on the Farm 217, 447, 669, 962
Range Shelters for Young Poultry 612
Sex-Linkage 1095
Preston, N. C.: Prevention of Finger-and-Toe 272
Prices, see also *Farm Values*.
Artificial Manures 100, 208, 317, 432, 550, 657, 761, 859, 949, 1062, 1174, 1271
Feeding Stuffs 108, 214, 322, 438, 554, 555, 766
Monthly Notes on Prices and Supplies 83, 192, 305, 421, 539, 645, 745, 842, 931, 1045, 1155, 1253
Publications, see also *Library* and *Notices of Books*.
Economic Series 1013, 1151
Guide to Current Official Statistics 463
Handbook of Commercial Treaties 972
Imperial Agricultural Bureaux Journals 577
Indian Agricultural Journals 955
International Year Book of Agricultural Statistics 1286
Leaflets and Bulletins 7, 9, 10, 346, 348, 465, 467, 686, 867, 871, 872, 886, 955, 983, 1071, 1072, 1095, 1204, 1284, 1285
Nutrition Abstracts and Reviews 459, 1095
Reports:
Agricultural Machinery Testing Committee 583
Agricultural Research Institutes, 1929-30 353
Agricultural Wages Regulation 681
Combine Harvesting in 1931 1280
Education and Research 884
Empire Marketing Board 702
Foot-and-Mouth Disease Research Committee 1207
Land Division 882
Marketing of Dairy Produce 402
Marketing of Potatoes 920
Marketing of Sheep, Mutton and Lamb 629
Rothamsted Annual 687
Sugar Beet Industry 395
Public Rights and Rural Commons 444

Queensland: Egg Pool Proposals 187

Rabbits:
British Angora Industry 351
Diseases of 348
Harper Adams Conference on 468
Rats, see *Pests*.
Rea, E.: Poultry-keeping on the Farm 217, 447
Reclamation, see *Drainage and Reclamation*.
Robinson, G. W.: Soil Surveys 379
Root Crops, see also *Potatoes* and *Sugar Beet*.
Preparation for Root Crops 92
Swedes, Manures for 207
Rural Community Councils .. ..
Russia, Agriculture in 243

Sanders, H. G., and F. H. Garner: Sulphuric Acid Treatment of Sugar-Beet Seed 8
Scott, Thomas: The Solution of a Breeding Problem 793
Seeds and Seed Testing, see also *Acts of Parliament*.
Grass Seed for Lawns 711
Seed Analysts' Conference 324
Seed-Testing Course and Examination 324
Sheep, see *Live Stock*.

PAGE
Shewell-Cooper, W. E.: Fruit Growing in Cheshire 1101
Shows, see *Exhibitions*.
Silage, see *Ensilage*.
Silver Fox Farming in Great Britain 706
Sisal, Binder Twine from East African 457
Smallholdings and Allotments:
Allotments for Unemployed 346
Finger-and-Toe in Gardens and Allotments 272
Forestry Workers' Holdings 460
Organic Manure for Allotments 350
Remarkable Smallholding in South Wales 814
Small Live Stock, see *Goats, Poultry, Rabbits* and *Diseases and Pests of Animals*.
Soils:
Methods of Analysis 705
Soil Surveys 379
Use of Peat in Horticulture 474
South Africa, Union of:
Farmers' Tour of Great Britain 573
Grading and Marking of Cheese 633
Grain Pool 527
Southern Rhodesia: Maize Control 836
Spence, A. G.: The Half-Bred Sheep 469
Stack Building and Thatching 264
Stapledon, R. G.:
Imperial Bureau of Plant Genetics (Herbage Plants), Aberystwyth 142
Improvement of Rough and Hill Grazings, I and II. .. 1109, 1215
Statistics, see *Agricultural Returns and Statistics*.
Stewart, W. A.:
Distinctive Features of Pig-Farming in Scandinavia 689
Notes on Feeding .. 101, 209, 318, 433, 551, 658, 762, 860, 950, 1063, 1175, 1272
Strawberries, see *Fruit*.
Sugar-Beet and Beet Sugar:
British Sugar Industry (Assistance) Act, 1931 .. .. .. 571, 744
Crop in England and Wales for 1930 129
Cultivation 93, 202
Estimation of Yield from Experimental Plots 494
Industry at Home and Abroad 395
Industry in Great Britain: Position of Factory Companies on March 31, 1931 1151
Nitrate of Soda, Time for Application 162
Nitrogenous Fertilizers 204
Production, 1931-32 .. .. 112, 922, 1014, 1149
Pulp as a Feeding Stuff 977, 993, 1114
Pulp for Baby Beef 993
Pulp for Milk Production 1114
Regional Prize Scheme, 1930 240
Relative Values of Oats, Beet-Molasses Pulp and Dried Sugar-Beet Pulp for Fattening Store Cattle 985
Storage on the Farm 806
Strains 1
Sulphuric Acid Treatment of Seed 8
Swedish Assistance to Industry 330
Sweden:
Import Monopoly for Wheat and Rye 1017
Pig-Farming 689
Sugar-Beet Industry 330
Swedes, see *Root Crops*.
Switzerland: National Mark for Agricultural Raw Materials .. 534
Sykes, E. T.: Time for Applying Nitrate of Soda to Sugar-Beet .. 162

Tasmania: Barley Growers' Marketing 634
Thomas, Brynmor, and J. Hargrave: Composition of Kitchen Waste 366

PAGE
Thomas, E.: Dorset Cheese-Making and Milk-Selling Farm .. 27
Thompson, J. K., and J. C. Wallace: Potato Silage 909
Thompson, R. J.: Notes on Prices and Supplies 83, 192, 305, 421, 539, 645, 745, 842, 931, 1045, 1155, 1253
Thomson, Sir J. Arthur: Animal Ferments 19
Tilley, H. B.: Molassed Beet-Pulp for Milk Production 1114
Tinley, N. L.: Economy of Washing Kent Sheep before Shearing .. 151
Tithe: Basis for Redemption of Tithe Rentcharge 354, 792

United States of America:
Agricultural Machinery 10
Two Years' Progress under the Agricultural Marketing Act .. 925

Vegetables, see also *Diseases and Pests of Plants*, *Marketing* and *Potatoes*.
Canned Industry and Agriculture 74
Lettuce Cultivation under Glass 998
Peas, Varieties for Canning 38, 44

Wages:
Agricultural Wages Regulation Report 681
Enforcement of Minimum Wages 119, 221, 333, 452, 559, 677, 774, 872, 970, 1076, 1186, 1286
Farm Workers' Minimum Wages .. 117, 331, 451, 559, 676, 872, 965, 1074, 1286
Wallace, J. C.:
Varieties of Peas for Canning 44
Wallace, J. C., and J. K. Thompson: Potato Silage 909
Walton, C. L., and H. G. H. Kearns:
Carabid Beetles as Strawberry Pests in the Cheddar Districts .. 373
Weather, see *Meteorology*.
Weeds:
Grassland Weeds 49
Sodium Chlorate as Control of 665
Weed Form of White Mustard 1091
West, C.: Cold Storage of Apples 585
Wheat, see *Cereals*.
Wigglesworth, A.: Binder Twine from East African Sisal 457
Wilson, T. O.: Storage of Sugar-Beet on the Farm 806
Witté, E.: Silver Fox Farming in Great Britain 706
Woodman, H. E., W. S. Mansfield, and F. H. Garner: The Relative Values of Oats, Beet-Molasses Pulp and Dried Sugar Beet Pulp for the Fattening of Store Cattle 985
Woodpeckers, British 147
Wool:
Coloured 215
Economy of Washing Kent Sheep before Shearing 151
Empire Wool Conference 926
Prices and Supplies 88, 197, 308, 425
Worthington, J.: Poultry-keeping on the Farm 669, 962

Young Farmers' Clubs:
International Dairy Cattle-Judging Competition 464
Judging Competitions, 1931 960

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